

AI AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
C I V I L I A N A N D D E F E N S E

In This Issue . . . Tank Transmissions in Production . . . Building

APRIL 1, 1952

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World's Biggest Bombers . . . Copper Substitutes
for Radiators . . . French Armored Military Car
. . . Precise Machining Produces Quiet Gears

A C H I L T O N P U B L I C A T I O N



Prevents rusting of piston pins

● Piston pins and other automotive parts stored in the plant and on the customers' shelves frequently rusted and had to be discarded, presenting a real problem for Chefford Master Mfg. Co., Inc., Fairfield, Illinois. The loss of inventory and the extra handling were expensive.

Taking their cue from the successful job being done by STANORUST Rust Preventive 4-V on temporary storage, the manufacturers tested STANORUST 3-X for the extended storage job, as recommended by a Standard Oil lubrication specialist. STANORUST 3-X passed the test. In the words of John Bodner of Chefford Master Mfg. Co., Inc., "... with no wrapping and little or no cleaning necessary to prepare the parts for use."

One of eight grades in the STANORUST Rust Preventive line, STANORUST 3-X provided the combination of protection, ease



of application (dipping), and freedom from discoloration that this job called for. One of these eight grades is certain to provide the answer to your own rust prevention problem. For details, call for the services of your Standard Oil lubrication specialist. Contact the Standard Oil Company office nearest you, or write: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY



(Indiana)

What's your problem?



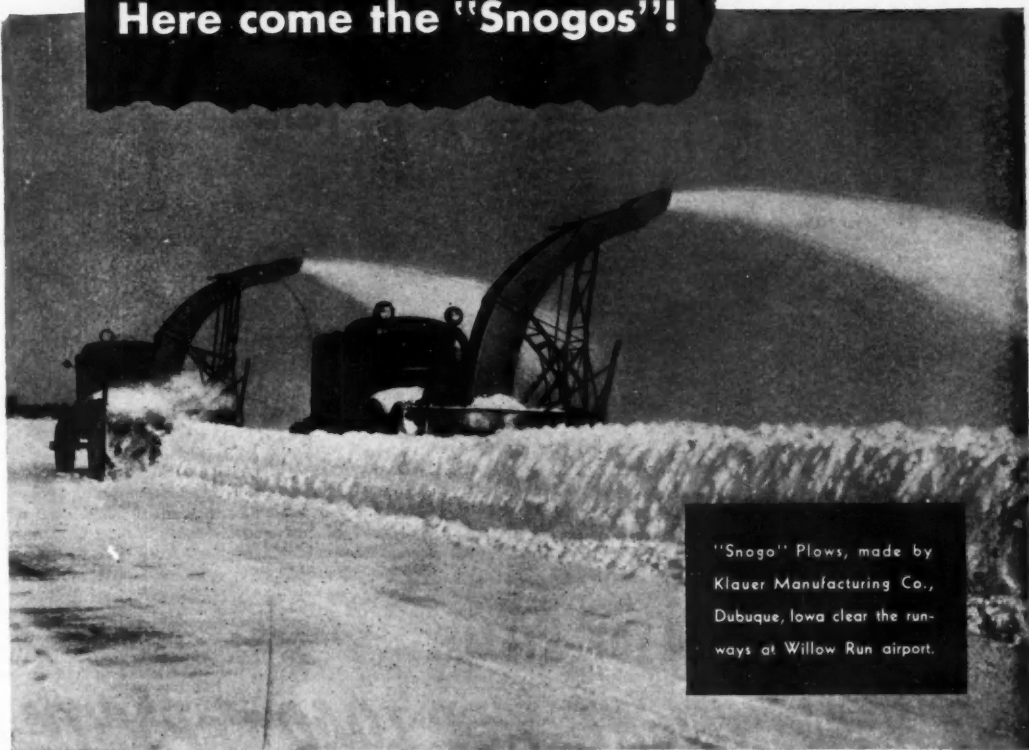
R. E. Murnahan, working out of Standard's Evansville office, is the lubrication specialist who helped this customer use STANORUST 3-X to solve a particular rust prevention problem.

Located throughout the Midwest is a corps of specially trained, experienced lubrication specialists, ready to give you prompt, on-the-spot help with your own lubrication problem. Their broad background of practical experience plus their thorough schooling in Standard Oil Lubrication Engineering classes, is yours for the asking. Just phone or write your local Standard Oil Company office. When the lubrication specialist stops at your plant, ask him about the following quality Standard products:

STANOIL Industrial Oils—This multi-purpose line of oils provides cleaner operation of hydraulic units, supplies effective lubrication in compressors, gear cases, and circulating systems. One or two grades can replace a wide variety of special oils and lubricants.

SUPERLA Greases—Available in lime soap and soda soap types, SUPERLA Greases cover a wide range of applications. These products are comparable in quality to the finest of special greases but are as readily available and economical as ordinary cup greases.

Here come the "Snogos"!



"Snogo" Plows, made by
Klauer Manufacturing Co.,
Dubuque, Iowa clear the run-
ways at Willow Run airport.

Operation snowbound . . . it takes six of these "Snogos", mounted on powerful four-wheel-drive trucks, to keep Willow Run open during the heavy Michigan snows. And it takes heavy-duty Cotta Reduction Units to operate with the kind of positive, around-the-clock dependability required on this strategic assignment. To convert conventional truck speeds to plowing speeds of 9 to 10 miles-per-hour, Klauer engineers, picked Cotta. Because solving the extra tough,

extra "grueling" speed reduction problems has been Cotta's specialty for 40 years. Whether it's for cranes . . . drillers . . . locomotives . . . shovels . . . generators . . . pumps . . . or rotary snow plows . . . heavy-duty Cotta Reduction Units give you utterly dependable, durable performance and long, trouble-free service life. If your speed reduction problem requires these characteristics, with input torque ranging from 150 to 2000 foot pounds, come to Cotta.

THIS INFORMATION WILL HELP YOU

Diagrams, capacity tables, dimensions and complete specifications sent free on request. Just state your problem—COTTA engineers will help you select the right unit for best performance. May we work with you?

COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS



COTTA

**HEAVY-DUTY
REDUCTION UNITS**

"Engineered-to-order"



Indianhead Truck Lines Cut Haulage Costs

▲ PAYLOAD INCREASED... 300 MORE GALLONS PER TRIP... because Butler Manufacturing Co., Kansas City, Mo., fabricated this transport of "COR-TEN," a nickel alloyed steel produced by U. S. Steel Co., Pittsburgh, Pa. Use of "COR-TEN" reduced dead weight of this unit about one ton, as compared with carbon steel.

BECAUSE NICKEL ALLOY STEELS *CUT DEAD WEIGHT...ADD LOAD CAPACITY*

ABOUT 2000 POUNDS OF DEAD WEIGHT is cut from this 7000-gallon gasoline transport by designing it to utilize high-strength low-alloy steel containing nickel.

The result: 300 gallons of gasoline can ride free on every trip... with increased safety through increased strength.

Producers as well as owners of vehicles save by using high-strength low-alloy steels containing nickel, because thin, light sections of these steels provide the same strength as thicker, heavier sections of plain carbon steel.

Moreover, these nickel alloyed steels resist abrasion and erosion as well as many types of corrosion, and thus lengthen equipment life substantially. In addition, they may be fabricated as easily as carbon steel.

Produced under various trade names by leading

steel companies, these high-strength steels containing nickel along with other alloying elements, provide three basic advantages:

1. High-strength in the as-rolled condition, permitting important weight reductions.
2. Excellent response to usual fabrication operations, including easy forming and welding.
3. Good resistance to corrosion, abrasion and impact.

At the present time, the bulk of the nickel produced is being diverted to defense. Through application to appropriate authorities, nickel is obtainable for the production of engineering alloy steels for many end uses in defense and defense supporting industries. Counsel and data on alloys containing nickel, for your present production or future projects, are yours for the asking. We invite inquiries.



THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET
NEW YORK 5, N. Y.

AUTOMOTIVE INDUSTRIES

April 1, 1952

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AUTOMOTIVE INDUSTRIES, April 1, 1952

WHEN... Graders Grunt ...YOUNG KEEPS THEM COOL!



The Young heavy-duty radiator shown on the right is used on the Austin-Western Master "99" Power Grader. These Young Radiators are built to give dependable service under all conditions.



The Austin-Western Co., Aurora, Ill., manufacturers of heavy-duty earth-moving machinery, rely upon Young radiators. These radiators maintain optimum engine cooling under heaviest loads and are built to withstand the severe shocks and strains. Young engineers have designed extra-large cooling capacity by proper selection of unique Young core section coupled with large volume tanks. This large volume tank provides a reserve water supply where equipment works at high altitudes, at high temperatures, or where local water is impure or scarce. The removable core simplifies all service and maintenance, especially important in export sales. For heavy-duty radiators that stay "on-the-job" year after year, a Young Sales Engineer will recommend the specific unit required.



YOUNG

Heat Transfer Products for Automotive and Industrial Applications.

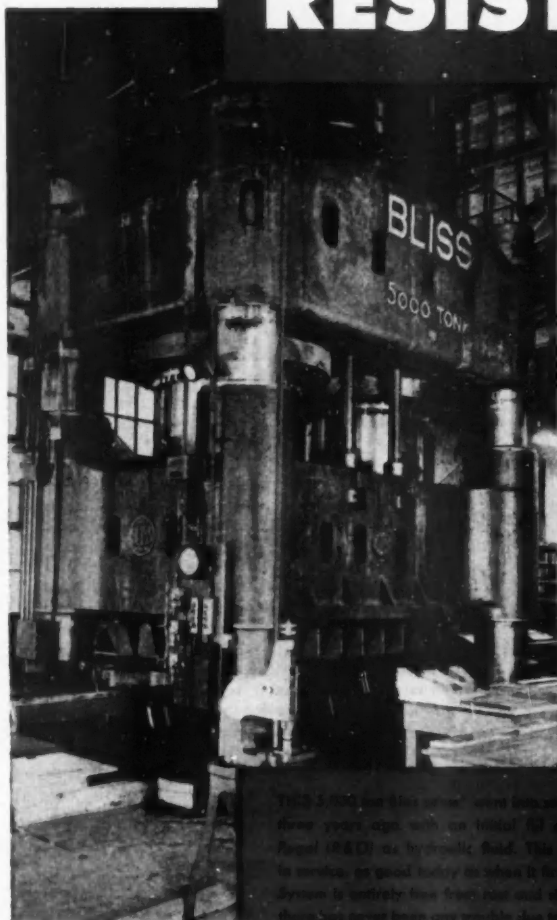
Heating, Cooling, Air Conditioning Products for Home and Industry.

YOUNG RADIATOR COMPANY

Dept. 102-D • RACINE, WISCONSIN
Factories at Racine, Wisconsin and Matteson, Illinois

Use the hydraulic oil that has

10 TIMES MORE OXIDATION RESISTANCE...



THIS 5,000-ton Bliss press, built in 1925, is still in service. It was built with an initial fill of Texaco Regal (R&O) as hydraulic fluid. This oil is still in service, no good reason to change it has been found. System is entirely free from rust and sludge and shows no wear from any possible cause for fouling.

Use **TEXACO** **REGAL OIL (R & O)**

To prevent sludge, rust and foam in your hydraulic systems, use turbine-quality *Texaco Regal Oil (R&O)*. This is the world-famous Texaco Regal Oil improved with special additives. Tests prove it more than ten times as resistant to oxidation as ordinary turbine-quality oils.

When you use *Texaco Regal Oil (R&O)* you can count on: 1) clean hydraulic systems; 2) smoother operation; 3) longer life for pumps and other parts; 4) freedom from unscheduled stoppages; and 5) lower maintenance costs.

There is a complete line of *Texaco Regal Oils (R&O)* to bring you these benefits no matter what the type or size of your hydraulic machines or the severity of service. They are approved by leading hydraulic manufacturers and preferred by operators everywhere.

For better, faster, lower cost machining of all metals, use *Texaco Cutting, Grinding and Soluble Oils*. You'll get longer tool life and better finish.

Let a *Texaco* Lubrication Engineer help you get maximum performance from all your metal working equipment. Just call the nearest of the more than 2,000 *Texaco* Distributing Plants in the 48 States, or write *The Texas Company*, 135 East 42nd Street, New York 17, N. Y.

*Name of user on request

TEXACO Regal Oils (R&O)

FOR ALL HYDRAULIC UNITS

Faithfully yours
50
for Fifty Years

TUNE IN . . . TEXACO STAR THEATER starring MILTON BERLE on television every Tuesday night. See newspaper for time and station.

no ONE chain serves every purpose



A 545-foot-long Link-Belt endless chain conveyor, using Link-Belt SS-1410 steel chain, on a combine-harvester assembly line. Speed is adjustable for either variable speed continuous duty or fixed speed intermittent operation.

LINK-BELT offers the RIGHT chain for every job...engineered to meet your requirements

Typical chains from the complete Link-Belt line



Class H Pintle chain—excellent for conveyors that slide, because of broad wearing surfaces.



Class C combination chain—popular, durable, low cost design for elevators, conveyors.



Class SS bushed roller chain with offset sidebars—for heavy drive service at moderate speeds.



Link-Belt "Flint-Rim" cast sprockets give extra long life. Cast steel sprockets are also available for most severe service.

Link-Belt offers no single "cure-all" chain to handle every job. From the most complete line of chains and sprockets—we can recommend the best type to fit your particular requirements—cast, combination, forged and fabricated steel, roller or silent. So, whatever your chain problems, large or small, Link-Belt engineers will work with you or your consultants to help solve them.

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in principal cities.

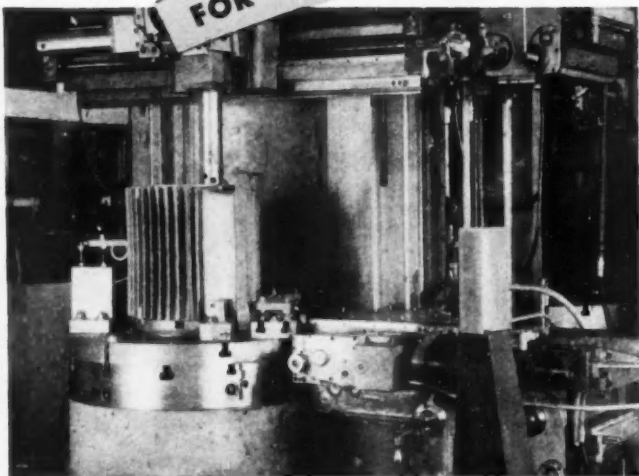
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CHAINS AND SPROCKETS

BULLARD MACHINE TOOLS

FOR GREATER MANUFACTURING ECONOMY



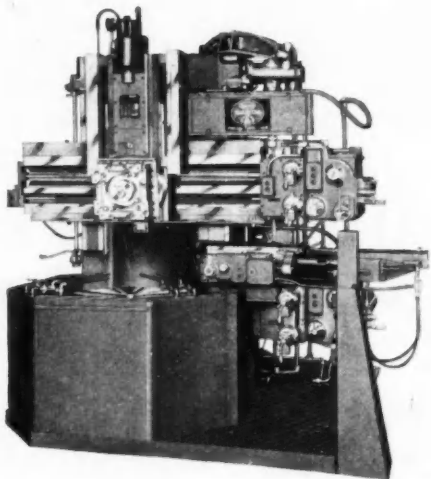
The inception of Bullard Man-Au-Trol Vertical Turret Lathes began a New Era of metal cutting in the field of single spindle turret lathes.

Man-Au-Trol principal provides both manual or automatic control of the machine and a simple method of predetermined operations easily reset for changes in work design.

Versatility and many modern features of Man-Au-Trol Vertical Turret Lathes place them at the top of the list for Greater Manufacturing Economy.

Machining an electric motor frame as illustrated above is only one of the many classes of work that Man-Au-Trol produces for the Greater Economic World in which we live.

The present urgency for delivery of electrical units needed to power all types of Industries, road building, agricultural, transportation and many, many other kinds of equipment are calling upon Bullard for delivery of Machine Tools to speed the manufacturing processes.



Learn more about Man-Au-Trol Vertical Turret Lathes built in 30-, 36-, 42-, 54-, 64-, and 74-inch sizes. Write for circular.



THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

(Advertisement)

Cork-and-Rubber Gasket Materials

made to meet government specifications

You can get samples from Armstrong of materials made to meet each class of the principal government specifications covering cork-and-rubber gasket materials. These materials are listed below.

Specification	Material	Specification	Material
MIL-G-6183			
Type I Soft.....	NC-709	Type II Soft.....	DC-167
Type I Medium....	NC-710	Type II Medium....	DC-100
Type I Firm.....	NC-711	Type II Firm.....	DC-113
MIL-T-6841.....	DK-153	MIL-G-6747.....	DK-149
	RK-304S		

For additional data on the materials above, call your nearest Armstrong Industrial Division office or see Sweet's file for product designers.

New cork-and-rubber compounds. Armstrong's Research and Development Center is ready to develop new cork-and-rubber materials to meet new military requirements as they arise. Please discuss your needs with your nearest Armstrong representative . . . or write.

Cork compositions. There is an Armstrong Cork Composition made to meet each of the classes under Federal Specification HH-C-576, as well as each of the grades under specification MIL-C-16090.

Synthetic rubber compounds. Armstrong makes specialized synthetic rubber compounds for critical uses. If you need an out-of-the-ordinary rubber compound, please discuss your requirements with your Armstrong representative. **Send for this gasket manual.** It contains 24 pages of information designed to help you make the best use of Armstrong's Gasket Materials. Included are discussions of subjects such as designing gaskets to reduce cost . . . practical tolerances for resilient gaskets . . . designing gaskets for efficient sealing, and others.

You'll find, too, up-to-date data on cork-and-rubber, cork composition, and straight synthetic rubber gasketing materials. Included are current government specifications and tentative SAE-ASTM specifications.

See "Armstrong's Gasket Materials" in Sweet's file for product designers. For personal copy, write Armstrong Cork Company, Gaskets and Packings Department, 1504 Arch Street, Lancaster, Pennsylvania.



ARMSTRONG'S GASKET MATERIALS

Your nearest Armstrong Industrial Division office

ALBANY 10, N. Y., 64 Northern Boulevard, Telephone: 4-0131 • BOSTON 16, MASS., 131 Clarendon Street, Telephone: COpley 7-2490 • CHICAGO 54, ILL., 13-136 Merchandise Mart, Telephone: DElaware 7-0500 • CINCINNATI 2, OHIO, 301 Temple Bar Building, Telephone: PARKway 3220 • CLEVELAND 15, OHIO, 209 Hanna Bldg. Annex, Prospect Ave. and E. 14th Street, Telephone: MAIn 1-7900 • DETROIT 26, MICH., 10th Floor, Free Press Building, 321 Lafayette Avenue, West, Telephone: WOODward 3-5670 • GREENVILLE, S. C., 33 Norwood Place, Telephone: GREENville 3-5302 • LOS ANGELES 13, CALIF., 719 Bendix Building, 1206 Maple Avenue, Telephone: RICHmond 0286 • NEW YORK 16, N. Y., 295 Fifth Avenue, Telephone: MURray Hill 4-6900 • PHILADELPHIA 2, PA., Robinson Building, Fifteenth and Chestnut Streets, Telephone: LOcus 4-4290 • ST. LOUIS 3, MO., 1203 Olive Street, Telephone: CHEstnut 1757 • IN CANADA: Armstrong Cork Canada Limited, 6911 Decarie Boulevard, Montreal, Quebec, Telephone: ATLantic 4733.

Eaton SODIUM COOLED VALVES save money for Truck Owners

Eaton Sodium Cooled Valves operate at considerably lower temperatures than do conventional valves and, therefore, last several times longer.


In general, maintenance of Eaton Sodium Cooled Valves in heavy duty truck engines is scheduled only at time of major engine overhaul. No in-between trips to the shop are necessary for servicing the valves. Engine output is maintained at high levels over long mileages. In many millions of miles of heavy-duty operation, Eaton Sodium Cooled truck valves have proved their ability to keep trucks on the road and out of the shop.



EATON

MANUFACTURING COMPANY
CLEVELAND, OHIO

VALVE DIVISION: 9771 FRENCH ROAD • DETROIT 13, MICHIGAN

 **PRODUCTS:** Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings • Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers



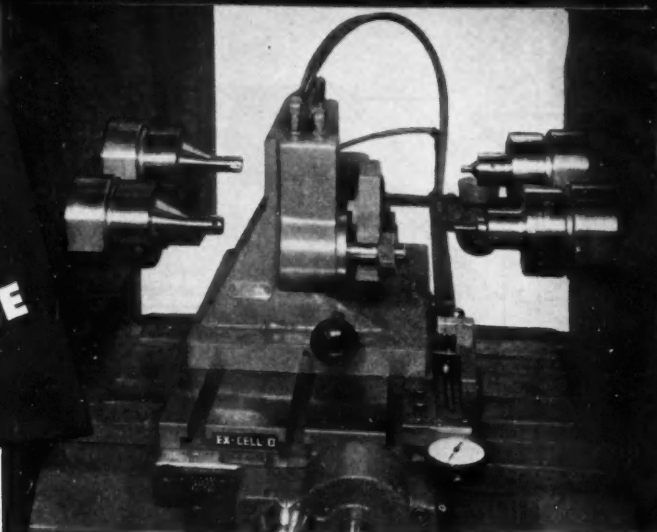
EX-CELL-O MACHINES SPEED DEFENSE



**STYLE 1212-A PRECISION
BORING MACHINE**

UPPER RIGHT: Style 1212-A Precision Boring Machine equipped with hydraulically clamping fixture supported by a manually operated cross slide for indexing. Operations are precision boring and line-boring.

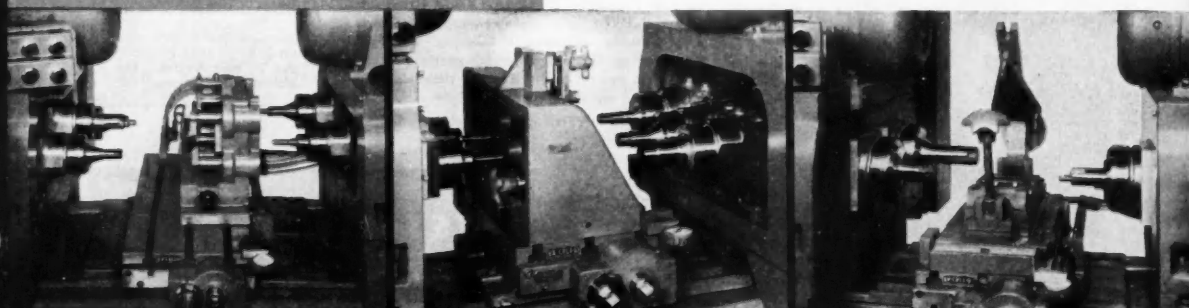
BELOW: All eight Ex-Cell-O Precision Boring Machines on this job (like the three shown here) have push button controls conveniently located on the left bridges. The simple fixtures are mounted on cross slides to provide indexing between various boring positions.



Typical Installation Involves Eight Ex-Cell-O Precision Boring Machines

Typical of Ex-Cell-O's contribution to the defense program is the recent installation of eight double-end Ex-Cell-O Precision Boring Machines in one plant. Used to finish magnesium and steel parts for aircraft electronic devices, they hold bore diameters to within .0005", some hole locations to within .0005", others plus or minus .0002".

While this is not a large program by Ex-Cell-O standards, it is interesting as an example of the help Ex-Cell-O machine tools and engineering are giving our patriotic defense equipment manufacturers. If you can use help of this nature contact your local Ex-Cell-O representative or write, wire or phone Ex-Cell-O in Detroit today.



EX-CELL-O CORPORATION DETROIT 32, MICHIGAN



PRECISION DEMANDS are always ASSURED

Technique of Western Felt production and processing has built an enviable reputation for engineering precision. Chemical specifications must be perfectly met—parts from wool softness to rock hardness are cut to close tolerances. As an extremely versatile material Western Felts are resilient, flexible, compressible. They resist oil, water, heat, age—do not ravel, fray or lose shape. New uses found daily. It pays to depend on Western Felt.

Check Possible Uses for Your Product

- Excluding dirt, grit, dust • Retaining lubricants
- Thermostatic insulation • Isolating vibration
- Cushioning shock • Padding, packing, seals
- Air and liquid filters • Gaskets, channels, etc.
- Grinding, polishing, etc. • Weight reduction
- Instrument mounts

Sheet and Roll Felt Manufactured for Special Purposes and To Meet All S.A.E. and Military Specifications.

WESTERN

4035-4117 Ogden Ave.,
Chicago 23, Illinois

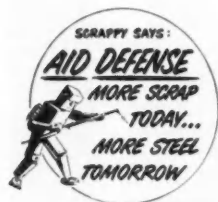
Branch Offices in Principal Cities

Felt
WORKS

MANUFACTURERS AND CUTTERS OF WOOL FELTS



Grandpa Never Threw a Thing Away



It's only human to want to hold on to things after they've outlived their usefulness. That's why today millions of tons of worn-out and obsolete equipment and machinery are lying forgotten in the country's plants and factories and on farms.

The steel industry needs these millions of tons of dormant scrap, needs

it in the worst way. With this vital dormant scrap the entire steel supply picture would brighten up, with more steel for everybody. But without it, the steel industry cannot hope to keep up production at present levels.

Call in a scrap dealer now, today. He will buy your dormant scrap and start it moving toward the steel mills.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

More Scrap Today... More Steel Tomorrow

Drills, Chamfers and Taps Tank Wheel Arms

Another Special by Cross



- ★ Drills, chamfers and taps four holes; drills chamfers and reams one hole in Tank Intermediate and Rear Wheel Arms.
- ★ Material—Cast Armor. Hardness—Rock. C35
- ★ 64 pieces (32 right and 32 left hand) per hour at 100% efficiency.
- ★ Duplex work holding fixture holds one right hand and one left hand part in each station.
- ★ Six-station power operated index table, including one for loading, two for drilling, one for chamfering, one for reaming and one for tapping.
- ★ Other features: Fluid motor index drive, J.I.C. standard construction with stranded wire, hardened and ground ways, hydraulic feed and rapid traverse, individual lead screw feed for tapping, Sav-A-Tap spindle construction.

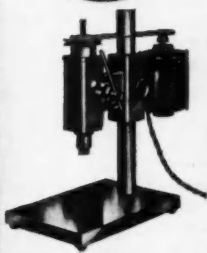
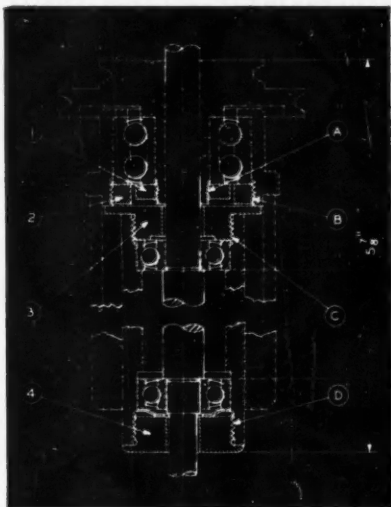
Established 1898

THE **CROSS** CO.
DETROIT 7, MICHIGAN
Special MACHINE TOOLS

WALDES TRUARC RETAINING RINGS GIVE PRECISION FASTENING

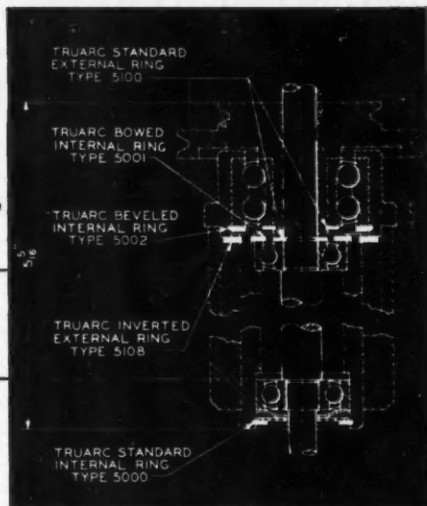
save \$3.50 per unit in redesign of miniature Spindle Assembly

BEFORE. 4 threaded retainers required to hold parts of drill press assembly together. Machining of threads was slow, costly...required skilled labor. Threaded retainers took up much space.



SAME
BEARING
SPACING

AFTER. 6 Truarc Rings require only 6 simple grooves...lock parts firmly together for life of unit. Quick, easy to apply...no skilled labor needed. Length of spindle assembly cut 9/16".



In Phillips & Hiss Company's new Miniature Drill Press, tolerances are critical... compactness, important. By using 6 Truarc Retaining Rings, they cut the length of the spindle assembly 9/16". The machine is more securely assembled, smaller, lighter. What's more—Truarc Rings eliminated threaded retainers and mating threads, saving 68 minutes of machining and skilled assembly time, or a saving of \$3.50 per unit.

Redesign with Waldes Truarc Rings and you, too, will save on assembly time, improve product

performance, facilitate easier servicing of whatever you make.

Wherever you use machined shoulders, bolts, snap rings, cotter pins, there's a Waldes Truarc Retaining Ring designed to do a better job of holding parts together. They're precision-engineered... quick and easy to assemble and disassemble. They give a never-failing grip, can be used over and over again.

Find out what Truarc Rings can do for you. Send your blueprints to Waldes Truarc engineers for individual attention, without obligation.

6 TRUARC RINGS (5 different types) EACH SOLVED A SPECIAL PROBLEM

STANDARD EXTERNAL RING } forms secure
STANDARD INTERNAL RING } shoulder, gives tight pressure fit when
installed in a groove.

INVERTED EXTERNAL RING
Provides uniform shoulder for curved
abutting surfaces.

BOWED INTERNAL RING
Takes up end-play resiliently, accom-
modates accumulated tolerances.

BEVELED INTERNAL RING
Takes up end-play rigidly, remains secure
against thrust and vibration.

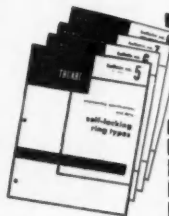


SEND FOR NEW BULLETINS →

**WALDES
TRUARC**
REG. U. S. PAT. OFF.
RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OR MORE OF THE FOLLOWING
U. S. PATENTS: 2,392,947; 2,392,948; 2,416,052; 2,420,921; 2,420,941; 2,420,765; 2,441,845; 2,455,145;
2,493,360; 2,493,362; 2,497,002; 2,497,003; 2,491,306; 2,509,001 AND OTHER PATENTS PENDING.



Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.
Please send engineering specifications and data on Waldes
Truarc Retaining Ring types checked below. AY-04

- ☐ Bulletin #5 Self-locking ring types
- ☐ Bulletin #6 Ring types for taking up end-play
- ☐ Bulletin #7 Ring types for radial assembly
- ☐ Bulletin #8 Basic type rings
- ☐ Send me information about the Waldes Grooving Tool.

Name _____
Title _____
Company _____
Business Address _____
City _____ Zone _____ State _____ 5678

AIR-PAK

HYDROVAC

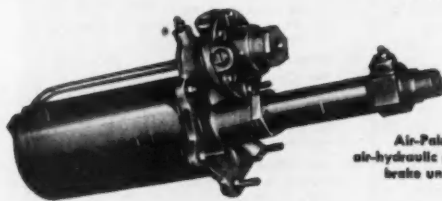
Either Way - YOU'RE ON THE ROAD TO BETTER POWER BRAKING!

There's no need to be puzzled about the question of efficient power braking for any commercial vehicle. Where the preference is for a hydraulic system, Hydrovac, with over two and a half million installations, has proven itself the undisputed leader in its field. And for vehicles where air actuated brakes are the choice, the new Bendix Air-Pak air-hydraulic power braking unit is foremost in its field.

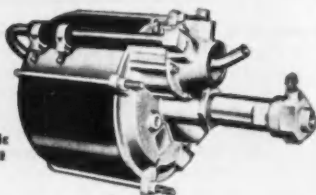
Air-Pak, similar in design and principle to the Hydrovac, changes air pressure into hydraulic pressure by means of two direct connected pistons, thus combining all the well proven advantages of hydraulic brake action with an air brake system.

Products of twenty-five years of practical braking experience, these outstanding power braking systems offer faster, more positive and better controlled braking. And in both the vacuum and the air actuated units, brakes can be applied instantly by foot power alone—a safety factor of tremendous importance. Remember, regardless of size of vehicle or whether your preference is for vacuum or air actuated brakes, for the industry's finest power braking systems—specify Bendix® Hydrovac® or Bendix Air-Pak.

*REG. U.S. PAT. OFF.



Air-Pak
air-hydraulic power
brake unit

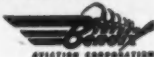


Hydrovac
vacuum-hydraulic
power brake unit

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High Spots of This Issue

Reader Service Simplified

INAUGURATED with this issue are quickly detachable postage-free reply cards, making it easier-than-ever for readers to send for Free Literature and Additional Information on Production and Plant Equipment, and New Products . . . See page 65.

Production of Allison Tank Transmissions

Here is the detailed story of the involved manufacture of transmission units for the General Patton and Walker Bull-Dog tanks, which are composed of the huge totals of 4000 and 5400 parts each, respectively. How full production on these intricate units has been achieved, is told beginning page 32.

Building World's Biggest Bombers

Convair's Fort Worth Division, although originally designed as an assembly facility for B-24 Liberator bombers, is well proportioned for production of the extremely large B-36 planes. Plant is 4000 ft long and 320 ft wide. See page 38.

Copper Substitutes in Radiators

SAE engineers proved cool to this proposition at the National Passenger Car Body and Materials Meeting held in Detroit last month. Their objective engineering reasons are outlined in this article, page 42.

New French Military Vehicle

An interesting French military vehicle having eight driving wheels, four of them retractable depending upon terrain, is described and illustrated, page 44.

Precision Machining Produces Quiet Gears

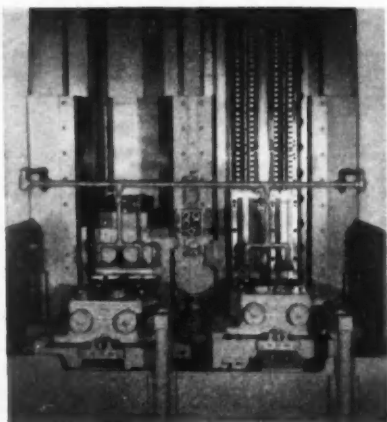
Due to the meticulous care with which Chrysler reduction gear sets are made, quietness, freedom from vibration, and durability are built in. The preciseness of manufacture of these units, for marine and industrial use, is discussed thoroughly, page 50.

New Products Items And Other High Spots, Such As:

Modern facilities for painting truck tank trailers; new production machines in the plant of Vauxhall Motors; Russia's Jet Warplanes; Metals; and design trends in commercial vehicles and engines.

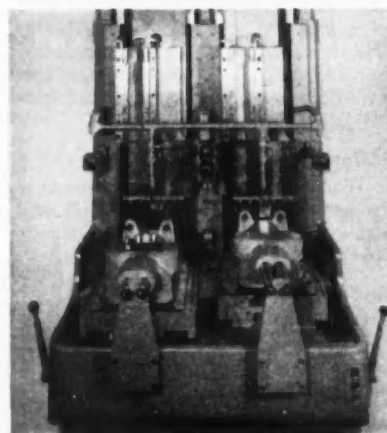
Automotive and Aviation News, Page 17
Complete Table of Contents, Page 3

AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES
• BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY •
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT
SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT



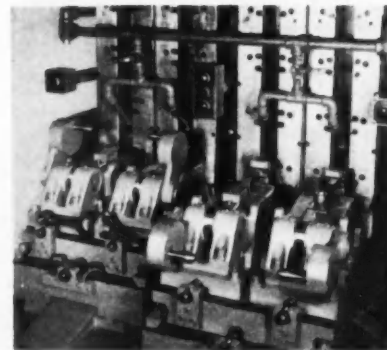
JOINT FACE AND HALF BORE

Part name..... Connecting rod
Material..... Steel forging
Operation..... Broach joint face and
half bore
Stock removal..... $\frac{3}{16}$ " max.
Production..... 518 per hour
Machine..... CINCINNATI No. 15-66 Du-
plex Vertical Hydro-
Broach, completely
equipped by Cincinnati
Application Engineers



CYLINDER CLEARANCE

Part name..... Connecting rod
Material..... Steel forging
Operation..... Broach cylinder
clearance
Stock removal..... $\frac{3}{32}$ " per side
Production..... 708 per hour
Machine..... CINCINNATI No. 10-54
Duplex Vertical Hy-
dro-Broach, com-
pletely equipped by
Cincinnati Applica-
tion Engineers



BOLT BOSSES AND NUT SEATS

Part name..... Connecting rods and
caps
Material..... Steel forging
Operation..... Broach sides of bolt
bosses, bolt and nut
seats
Stock removal..... $\frac{5}{16}$ " max.
Production..... 230 rods and caps per
hour
Machine..... CINCINNATI No. 10-66 Du-
plex Vertical Hydro-
Broach, completely
equipped by Cincinnati
Application Engineers



THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

CINCINNATI



MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES
FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

typical
hydro-broach
operations
ON
CONNECTING RODS
AND CAPS

CINCINNATI Hydro-Broach Machines, completely equipped for production by Cincinnati Application Engineers, offer high production at low cost and minimum maintenance expense. Three examples illustrated here are typical set-ups for connecting rods and caps; the type of work which must be produced without interruption. ¶ These machines are in short supply at this time, but you might like to know more about them for future applications. Write for catalog No. M-1709-1.

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 106, No. 7

April 1, 1952

Ford Announces Three Industrial Engines

Three new heavy-duty industrial engines, said to be designed for greater efficiency, performance, and operating economy, were recently announced by Ford Motor Co. The overhead-valve units bring to six the number of Ford Engines built for industrial applications.

The new engines are the Ford "317," "279," and "215". The numbers identifying each engine correspond to its piston displacement in cu in. The first is rated at 140 bhp at 2800 rpm and is a V-8 with 3.8 in. bore and 3.5 in. stroke. The second is rated at 125 bhp at 2800 rpm and is also a V-8 with a 3.56 in. bore and 3.5 in. stroke. The "215" is a six-cyl engine rated at 93 bhp at 2800 rpm. It has a 3.56 in. bore and a 3.6 in. stroke.

The company also announced availability of a new Ford Multi-Torque converter for use with the Ford "215", "239", and "254" engines. It reportedly combines the characteristics of a fluid coupling and torque multiplication and is said to be designed to absorb shock overloads, prevent stalling under excess loads, and start bigger loads faster.

Total Vehicle Scrappage Hit 4,361,441 During Year 1951

Passenger car and truck scrappage in 1951 reached all-time record levels, more than double the 27-year average scrappage rate, according to a recent final report by R. L. Polk & Co. Preliminary estimates of vehicle scrappage were previously published in these pages (see Feb. 15 issue of AUTOMOTIVE INDUSTRIES, page 22).

Total scrappage was 4,361,441 vehicles, including 3,711,820 passenger cars and 649,621 trucks. This compares with the 27-year average of 1,989,888 vehicles.

In spite of 6,064,753 new vehicles (5,060,903 new passenger cars and 1,003,850 new trucks) registered during the past calendar year, the total of vehicles in use has increased by only 1,703,000 units (1,349,000 cars and 354,000 trucks).



United Press Photo

IMPROVED NAVAL FIGHTER

Larger and heavier than its predecessor, the original Cutlass, this Chance Vought F7U-3 carries more armament. Security regulations prohibit publishing statistics of the new twin jet fighter. The original Cutlass was the first swept wing, tailless fighter to operate from a carrier.

Big Increase Foreseen in Tank Assembly Jobs

By late 1952 employment in tank assembly is expected to total 45,000—seven times the number employed prior to the outbreak in Korea, according to a survey of the industry by the Department of Labor's Bureau of Labor Statistics.

An estimated 15,000 were employed in the industry in July, 1951, BLS reported. The greatly increased number of workers to be added this year will man the assembly lines of defense mobilization which will be capable then of producing 35,000 tanks a year.

Upon our entrance into World War II, approximately 22,000 workers were turning out tanks. Mostly then they were producing for our allies when the United States entered the war. Employment in the industry more than doubled between Pearl Harbor and the latter part of 1943 when tank production employment reached a peak with more than 50,000 workers on the payrolls.

Tank producers now have greater capacity and experience in making military equipment than at the beginning

of World War II. Consequently, the build-up in employment is expected to be at a more rapid rate than in 1941-43. Tanks now coming off production lines weigh about 50 per cent more than the comparable models of World War II and contain far more complex weapons and fire control equipment.

Nash Still Undecided on Building Two-Passenger Car

In a recent progress report on its four-cyl, two-passenger NXI car, which was shown to the public two years ago, Nash Motors Div. of Nash-Kelvinator Corp. stated that as yet no decision has been made to build the vehicle.

Three models of the car, now called the "NKI" (Nash-Kelvinator International), have reportedly been completely engineered and made ready for tooling with a number of changes incorporated. The models include a convertible, a hardtop convertible, and a standard coupe, and a few of these have been built for experimental and testing purposes.

The NKI models have an 85 in. wheelbase, are said to give 35 to 40 miles to the gallon at speeds of from

News of the AUTOMOTIVE

30 to 50 mph. The car would be powered by a European-built engine and would have a top speed of 70 mph. The company asserts that interest in the car has been strong, but that the Korean war and unsettled international conditions have delayed the decision to build the NKL.

Proved Petroleum Reserves Reach All-Time High

Impressive gains in the nation's proved reserves of liquid petroleum and natural gas were made in 1951, according to an announcement by the American Petroleum Institute and the American Gas Association. In a joint report based on the deliberations of their reserves committee the two trade associations made these cheering summations:

Proved reserves of liquid petroleum and natural gas reached new all-time peaks as of last December 31; proved reserves of liquid petroleum rose from 29.5 billion barrels in 1950 to 32.2 billion barrels in 1951, a net increase of 2.7 billion barrels; proved reserves of natural gas went from 185.6 trillion cu ft in 1950 to 193.8 trillion cu ft in 1951, a net increase of 8.2 trillion cu ft.

The net increase of 2.7 billion barrels in proved reserves of liquid petroleum is the greatest one-year addition in history; the net increase of 8.2 trillion cu ft in natural gas reserves is the second largest of all time. Both net increases

were achieved despite record-breaking production of 2.5 billion barrels of liquid petroleum and 8.0 trillion cu ft of natural gas in 1951.

In round figures, this remarkable performance means that for every barrel of oil or cu ft of natural gas withdrawn from the ground in 1951, two new barrels of oil or two new cu ft of natural gas were found or developed—one of which compensated for the production and the other of which went into net reserves.

Another astonishing facet of the liquid petroleum report is the fact that the total of new liquid petroleum supplies developed in 1951 exceeded five billion barrels. This is the first time that the oil industry ever topped the five-billion barrel mark for new oil supplies in any one year.

Pacific Automotive Show Largest Yet Held

Over 50,000 automotive tradesmen thronged to the largest Pacific Automotive Show yet held. The latest and best in materials and facilities for repair and maintenance were shown in Los Angeles' Pan Pacific Auditorium to automotive jobbers, car dealers, fleet owners and automotive service establishments of the 11 Western states. A total of 584 exhibit spaces was taken by 365 exhibitors, 500 in the 90,000 sq ft auditorium and a spillover of 84 in a large

circus tent annexed to the auditorium. Pacific Automotive Show is attempting to establish a regular rotation for the show—this year in Los Angeles, San Francisco in 1953, and Seattle or Portland the following year, E. S. Jungmeyer, show manager, told AUTOMOTIVE INDUSTRIES.

NPA Increases Second Quarter Quotas for Cars and Trucks

After weeks of discussion and wrangling, the National Production Authority has finally approved increased quotas for the production of passenger cars and trucks during the second quarter of 1952. The industry will now be permitted to turn out 1,050,000 cars and 250,000 trucks, as opposed to the 930,000 cars and 220,000 trucks allowed under former quotas.

However, the Government will permit the industry to purchase only enough materials to produce 1 million cars, and the remainder needed must be procured from inventory stocks. As far as trucks are concerned, however, manufacturers will be granted enough materials to turn out the 250,000 allowed without dipping into inventories.

While it is not expected that the new quotas will do much to relieve the immediate unemployment situation in Detroit, they will undoubtedly aid appreciably in preventing the further layoffs that would have occurred if the



HEAVY FIELD DYNAMOMETER

The M-7 dynamometer, shown in action at the Aberdeen Proving Ground, is 44.5 ft long, 11.5 ft high, and 10 ft-10 in. wide at the rear bogie. It is powered by two Ford GAN-C V-8 gasoline tank engines rated at 50 bhp (bare engine) at 2600 rpm. The power

train consists essentially of the two engines driving two electric generators which supply power for four electric propulsion motors. Two pumps supply oil under pressure for the Vickers hydraulic steering booster. Westinghouse air brakes are used on all wheels.

AND AVIATION INDUSTRIES

previous quotas had been maintained. It has been estimated by a reliable source that unemployment in Detroit at the middle of February stood at 102,000.

Alcoa Completes Smelting Line at Point Comfort, Texas

Aluminum Co. of America recently announced the opening of the first of two new smelting lines at its Point Comfort, Tex., plant. The new line is said to increase the plant's capacity to 135 million lb of aluminum annually. The second new line is scheduled for completion within three months.

Mobilgas Announces New Rules for 1952 Economy Run

The 1952 Mobilgas Economy Run will be over a long, rugged course from Los Angeles to Sun Valley, Ida., April 14, 15 and 16. For the first time the exact route of the Run will remain a mystery until the entries are placed in final impound, thus eliminating practice over the course by the competing cars.

The distance will be more than 1000 miles, the longest Run in the history of the event, and will take three days' driving time. The test will be, as in previous years, under supervision of the contest board of the American Automobile Association. A. C. Pillsbury, regional director, will be in charge of all

of the technical and mechanical details.

Each car in the Run will compete against others in its own price range for top honors in 11 price classes, including two special lightweight groups, as well as for the sweepstakes trophy. Thus, at the conclusion of the event, 11 class winners and a sweepstakes winner will be announced and awarded trophies.

Performance of all cars is computed on a ton-mile per gallon basis, which is determined by multiplying the gross vehicle weight, in tons, by miles and dividing that figure by the number of gallons of gasoline consumed.

Great care will be taken to see that all competing cars are strictly stock models. Without advance warning entries will be selected from assembly lines, warehouses or dealer showrooms. The makers' chances will rest on the performance of the car thus chosen.

From the time the car is selected it will be under the strict surveillance of the AAA. It may be removed from storage and driven by the entrant or his representative, under the supervision of a AAA observer, on public roads or highways for the purpose of breaking in. The number of miles will be at the entrant's discretion but in no case may the total mileage on the car at the start of the Run exceed 2500 miles.

The competing cars will leave the General Petroleum garage early on the morning of April 14. A minimum of

three male adult occupants (driver, relief driver and observer) and one other passenger must be carried. These four persons will be credited with a total weight of not more than 750 lb, and the contest board will add ballast, if necessary, to bring the poundage up to that total.

The cars will leave Los Angeles at two-minute intervals, and two all-night stop-overs will be made enroute to Sun Valley at which times the cars will be impounded and kept under constant vigil by the AAA. Entrants may choose as fuel either Mobilgas or Mobilgas Special, whichever they feel is best suited to their engine.

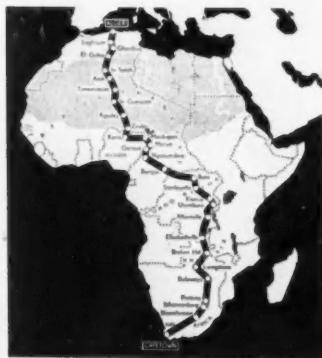
Large Crowds Attend Los Angeles Show

Despite bad weather during the entire show, more than 150,000 people flocked to the 29th Los Angeles International Auto Show held March 7 through 16. It was the first show since 1940. This automobile conscious area saw 148 American and foreign cars built by 31 manufacturers, and many engineering displays. Automobile enthusiasts had an opportunity to make comparisons between U. S. and imported cars of every price range. This is the first time in the Los Angeles area that complete lines of body styles of a majority of imported cars have been displayed on the same floor with full lines of American cars. Exhibitors re-



FIAT DESERT CHALLENGER

The Fiat four-wheel drive Campagnola at the left above, with a fully loaded trailer attached, was recently driven by Paolo Butti and three companions a distance of approximately 9500 miles from Algiers to Cape Town, Africa, in 50 days along the route shown



on the map at right. Only six and a half days were required to cross the nearly 2360 miles of Sahara Desert. According to reports, the four-cyl, 53-hp car performed excellently throughout the entire trip, in the face of such obstacles as sand, mud, cold and heat.

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ported brisk selling right from the floor.

Charles H. Elmendorf, executive secretary, Los Angeles Motor Car Dealers Association, sponsor of the show, told AUTOMOTIVE INDUSTRIES that the association plans on making this an annual event.

Keller Cites Obligations of Industry in Defense Program

As the key point in a speech made recently in Wilmington, Del., Robert T. Keller, general manager of Chrysler Corp's Delaware Tank Plant, emphasized that industry has a two-fold defense responsibility in the construction of manufacturing facilities for limited military production now, with capacity for expanded production if needed in the future.

Explaining the vast differences between World War II military production and the current defense program, he stated that the general public often attempts to compare the two on similar levels. Mr. Keller cited the attempt to superimpose a vast defense program on top of an active civilian economy and the maze of Government controls as factors which did not exist to such an extent in 1940.

He went on to say, however, that, in spite of these difficulties, the lessons learned during World War II were

proving invaluable today. It is his feeling that Ordnance and Industry have a much better mutual understanding of each other's problems as a result of previous experience in working together.

Activities of U. S. Steel Corp. at New High in '51

In 1951 the production, sales, shipments, rates of operation and movement of iron ore from mines to furnaces by United States Steel all were greater than in any previous year of its history, according to the corporation's annual

report for 1951. It paid greater hourly and weekly earnings to its employees than in any previous year and amounts for Government in the form of taxes also achieved record-breaking levels, with provision for Federal taxes on income more than five times the total of the dividends declared on the common stock for the year.

Throughout the year the prices of steel products were not fixed by competitive forces, but rather were under arbitrary Government control. The general level of steel prices has not been raised to cover increases in costs since the last general advance in steel prices on December 1, 1950. As a result U. S. Steel's income for the year 1951, despite record-breaking production and sales, fell far short of approaching a new high figure. Its profit margin of 5.2 per cent of sales in 1951 was at the lowest level experienced by U. S. Steel in any year of high operations when the country was not engaged in all-out war. In 1950 this percentage of sales was 7.3.

Cold Rubber Capacity Uppe by New Production Method

A 30 per cent increase in output of "cold" GR-S American rubber is made possible by a major improvement in the manufacturing process employed at the government-owned Port Neches, Texas, rubber plant of B. F. Goodrich Chemical Co.

The new process, using existing plant facilities, is said to increase reaction rates 30 per cent or more. Overall cost of the rubber is lowered by a reduction in the amount of auxiliary chemicals used to promote the rubber-forming chemical reaction. The cold GR-S so

REGIONAL SALES OF NEW PASSENGER CARS

Zone	Region	January 1952	December 1951	January 1951	Per Cent Change	
					January over December	January over January 1951
1	New England	15,877	15,067	26,666	+ 5.45	-40.46
2	Middle Atlantic	52,132	59,050	81,241	-11.72	-35.83
3	South Atlantic	42,412	39,107	63,777	+ 8.45	-33.50
4	East North Central	74,837	71,050	115,509	+ 5.33	-35.21
5	East South Central	14,382	16,867	24,453	-11.77	-39.21
6	West North Central	32,385	32,622	45,443	- 7.3	-28.73
7	West South Central	29,535	31,456	51,997	- 6.11	-43.20
8	Mountain	8,955	11,415	16,611	-21.55	-46.09
9	Pacific	30,364	33,456	47,039	- 9.25	-35.45
Total - United States		301,379	310,064	472,766	- 2.81	-36.25

States comprising the various regions are: Zone 1: Conn., Me., Mass., N. H., R. I., Vt.—Zone 2: N. J., N. Y., Pa.—Zone 3: Del., D. C., Fla., Ga., Md., N. C., S. C., Va., W. Va.—Zone 4: Ill., Ind., Mich., Ohio, Wis.—Zone 5: Ala., Ky., Miss., Tenn.—Zone 6: Iowa, Kan., Minn., Mo., N. D., S. D.—Zone 7: Ark., La., Okla., Tex.—Zone 8: Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo.—Zone 9: Cal., Ore., Wash.



GERMAN GAS MISER

The limousine above is one new model in the German Auto Union DKW line of cars. A popular small car with a high cruising speed of 60 mph and a reported economical gas consumption of 43 miles to the gallon, the DKW is powered by a twin-cylinder, two-stroke engine. Other mechanical features include: thermo siphon water cooling system; Solex carburetor; and air cleaner with intake silencer.

AND AVIATION INDUSTRIES

produced is appreciably more uniform in quality, and the process requires less exacting technical control.

Now in full scale production at the Texas plant, the process uses a tetrasodium salt of ethylene diamine-tetraacetate, which forms complex compounds with the iron, calcium and magnesium ordinarily found in water. This chemical is added to the water used in making cold GR-S latex.

Time required for the rubber making reaction is decreased by three to four hours, which results in more cold rubber produced in each polymerizer during a given period. By using the water treating chemical, smaller amounts of catalysts are necessary.

Truck Sales Above Output In Final Half of 1951

Retail sales of new motor trucks exceeded domestic production by more than 53,000 units in the latter half of 1951, according to reports of manufacturers to the Motor Vehicle Div. of the National Production Authority, the Automobile Manufacturers Association revealed recently.

As a result, field stocks of new trucks in the hands of dealers showed a substantial decline during the period. The NPA figures showed that stocks of used trucks also had declined slightly.

GM Employment Showed Decrease During 1951

Employment in General Motors Corp. plants in the U. S. decreased during the second half of 1951 because of Gov-

ernment curtailment of automobile and truck production. Despite higher hourly earnings, its total U. S. hourly-rate payrolls were less in 1951 than in 1950, the company stated. Average hourly-rate employment in the U. S. was 310,173 in the fourth quarter of 1951, or about 43,000 less than in the first quarter.

Defense deliveries by GM in 1951 met scheduled Government orders and were substantially higher than in 1950, but were not large enough to offset the decline in production of passenger cars, trucks, and other civilian products in the second half resulting from Government restrictions. It was further stated that even when GM's new and highly technical defense assignments do reach the production stage later in 1952 or early in 1953, the volume of deliveries, as now scheduled, will be far less than GM's capacity to produce.

The average number of hourly-rate employees working in the U. S. totaled 326,418 in 1951, compared with 336,933 a year earlier. Total hourly-rate payrolls in the U. S. were \$1,292,857,463

in 1951, as against \$1,324,259,427 in the preceding year. GM world-wide employment in 1951 averaged 469,197, compared with 465,239 in 1950. Total payrolls in 1951 were \$1,868,997,017, compared with \$1,809,218,043 in 1950.

Continental Motors Report Show High Sales, Profits

Sales and earnings of Continental Motors Corp. in the fiscal year ended Oct. 31, 1951, were the best since 1945, according to its recent annual report. Net earnings, after income and excess profits taxes of \$6,702,573, amounted to \$4,469,063, compared with net earnings of \$3,611,245 in the previous fiscal year.

Net sales of \$166,677,855 for the 1951 fiscal year were 73 per cent in excess of the \$96,404,468 total for the previous year. Net working capital at the close of the year stood at a record level of \$26,008,873, compared with \$25,056,193 the preceding year.

Tinted Window Glass Offered by Chevrolet

Chevrolet Motor Div. of General Motors Corp., has announced the availability of tinted glass for all windows (except the convertible rear window) in its 1952 models.

NPA Removes Restrictions on Automatic Transmission Use

The National Production Authority has revoked its M-68, the order which formerly controlled automobile production, including restrictions on the percentage of cars manufacturers may equip with automatic transmissions. The Controlled Materials Plan continues to provide a broad limitation through quarterly allotments of metals to automobile manufacturers, but they are now

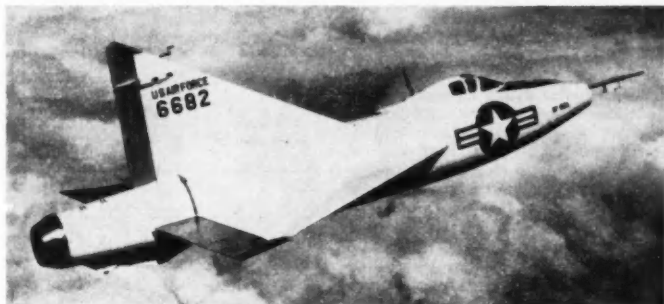
1952 MOTOR VEHICLE FACTORY SALES*

	Passenger Cars	Trucks	Buses	Total
January, 1951.....	476,508	127,863	661	604,933
December, 1951.....	292,709	87,006	845	380,560
January, 1952.....	273,572	101,080	776	375,418

1952 MOTOR TRUCK FACTORY SALES BY G.V.W.*

	5,000 lb. and less	5,001-10,000	10,001-14,000	14,001-16,000	16,001-19,500	19,501-26,000	Over 26,000	Total
January, 1951.....	56,290	23,692	7,864	23,289	6,717	6,361	3,370	127,863
December, 1951.....	32,100	15,467	5,290	18,533	4,721	7,740	3,147	87,006
January, 1952.....	35,127	17,632	5,914	22,409	5,366	9,176	4,234	101,080

* Automobile Manufacturers Association.



United Press Photo

AFTERBURNER ADDS THRUST

A Convair XF-92A making one of its many test flights at Edwards Air Force Base. The new afterburner adds to the thrust of the plane's J-33-A-29 engine.

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1952 NEW PASSENGER CAR REGISTRATIONS*

Arranged by Makes in Descending Order According to the January 1952 Total

MAKE	January 1952	December 1951	January 1951	Per Cent of Total	
				January 1952	January 1951
Chevrolet	66,790	65,621	114,523	22.19	24.26
Plymouth	40,378	26,040	39,312	13.40	8.32
Ford	39,815	55,088	76,592	13.21	16.62
Buick	23,498	25,136	37,396	7.80	7.91
Pontiac	22,362	23,347	37,362	7.42	7.90
Dodge	16,367	17,103	23,471	5.43	4.96
Oldsmobile	15,831	17,187	22,469	5.25	4.75
Studebaker	14,879	12,511	19,422	4.94	4.11
Mercury	12,299	15,491	22,960	4.01	4.86
Chrysler	9,524	8,142	12,573	3.16	2.66
Nash	8,993	8,956	11,228	2.98	2.37
De Soto	8,599	7,906	9,891	2.19	2.09
Hudson	5,099	5,559	9,334	1.69	1.97
Cadillac	4,473	6,551	9,441	1.45	2.00
Packard	4,406	4,622	7,000	1.45	1.48
Kaiser	2,808	2,796	5,533	.93	1.17
Henry J.	2,386	2,484	4,597	.79	.96
Willys	1,752	1,238	2,421	.56	.51
Lincoln	842	1,416	2,810	.31	.59
Crosley	265	243	542	.09	.11
British Austin	406	353	424	.13	.09
British Ford	305	267	291	.10	.06
Misc. Domestic	44	185	197	.01	.04
Misc. Foreign	1,155	1,025	1,054	.33	.22
Total—All Makes	301,379	310,084	472,796	100.00	100.00

* Based on data from R. L. Polk & Co.

† Includes All State.

able to use the materials in automatic transmissions if they wish.

Previously, manufacturers could install automatic transmissions in only 35 per cent of all cars with a factory-delivered price of \$1800 or less, as of July, 1951. The limit formerly imposed on cars in the \$1801 to \$2500 class was 65 per cent. No restrictions had been placed on the number of transmissions in cars priced at over \$2501.

DMPA Signs Contract for Canadian Nickel, Cobalt

Under the terms of a contract recently negotiated by the Defense Materials Procurement Agency with Falconbridge Nickel Mines, Ltd., Toronto, Canada, 50 million lb. of nickel will be bought by the Government over the next nine years. Purchase of up to 1.5 million lb. of cobalt also is included in the contract, while other options provide for the possible sale of 25 million lb. of copper and an additional 25 million lb. of nickel during the life of the agreement.

The Canadian concern has reportedly agreed that until the end of 1956 not less than 40 per cent of its entire production of nickel and cobalt will be sold to the American market. The

contract involves a Government advance of \$6 million to Falconbridge for expansion of its productive capacity.

Two Belgian Firms to Build U. S.-Style Trolley Coaches

Two firms in Belgium have joined hands for the production of what are said to be the first American-style electric trolley coaches to be made in Europe. The trolley coaches will be built according to American designs furnished by Westinghouse Electric Corp. and by Marmon-Herrington Co. under terms of license agreements recently concluded with the Belgian firms.

Ateliers Metallurgiques de Nivelles, Belgium, has been licensed by Marmon-Herrington to produce the coaches. Ateliers de Construction Electriques de Charleroi will make the traction motors and controls for the units, as licensed by the Westinghouse Electric International Co.

The new trolley coaches will be of self-contained design, differing from most European models in which the body is separate from the chassis. The control has reportedly been simplified to eliminate about half of the contacts and other parts subject to wear.

International Turns Out Its 8000th Australian Tractor

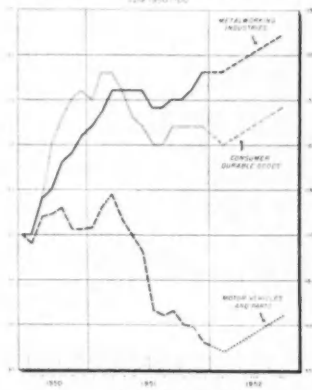
The 8000th Farmall tractor to be manufactured in Australia by International Harvester since 1946 recently moved off the production line at the company's large farm equipment plant located at Geelong, 44 miles southwest of Melbourne. Currently producing tractors at the rate of 300 per month Geelong Works (part of the manufacturing facilities of the International Harvester Co. of Australia, Pty. Ltd.) reportedly has turned out more than 3000 in the past year alone.

The Geelong plant also produces power units and a complete line of farm implements especially designed and tested for service in Australian farming areas. In addition, the plant assembles such major truck components as engine blocks and flywheel housings for the new IH motor truck works at Dandenong.

Cleveland Graphite Bronze Acquires Brush Development

Acquisition of the Brush Development Co. by the Cleveland Graphite Bronze Co. was completed with the formal exchange of all of Brush's 78,309 outstanding capital shares for 133,115 shares of common and 15,654 shares of 4½ per cent preferred stock of Cleveland Graphite Bronze. The Brush business will continue to operate under its own name in its present locations and with its present management.

EMPLOYMENT IN METALWORKING INDUSTRIES



AND AVIATION INDUSTRIES



NEW DECELERONS ON F-89

This illustration shows the "speed brakes" (arrows) of the Scorpion F-89 operating in flight. These decelerons are said to maintain full control of speed when the fast plane is coming in for a landing.

United Press Photo

DuPont Profit Falls in 1951 Production and Sales Soar

Although it chalked up the highest production and sales (1.31 billion) in its 150-year history during 1951, E. I. DuPont de Nemours and Co., Inc., had net earnings of \$221 million, \$87 million or 28 per cent less than in 1950. The decline in net earnings was attributed largely to an estimate of Federal taxes on income and amounts payable under the Renegotiation Act of \$371 million.

Of the sales increase, which amounted to \$234 million, approximately 55 per cent was due to greater physical volume of products, and 45 per cent to higher sales prices, the majority of which became effective late in 1950 and early in 1951. DuPont sources accounted for \$147 million of the \$221 million net earnings, while the remaining \$74 million came from General Motors Corp. dividends.

GM Annual Report Shows Decline of 39 Per Cent in 1951 Income

According to its recent annual report, total dollar sales of all General Motors Corp. products were only one per cent lower in 1951 than in 1950, but net income was off 39 per cent. Net income amounted to 6.8 per cent of sales, compared with 11.1 per cent in 1950. Due to higher tax rates, taxes took a substantially larger proportion of GM's income in 1951 than in 1950. Earnings on the common stock were \$5.63 per share in 1951, as against

\$9.35 per share in the previous year.

Dollar sales amounted to \$7.466 billion in 1951, compared with \$7.531 billion a year earlier, a decline of \$617 million in civilian sales being largely offset by a \$552 million increase in defense deliveries. The 1951 sales were divided into \$6.705 billion of civilian

products and \$761 million of defense materials. The 1950 figures were \$7.322 billion and \$209 million, respectively.

Net income in 1951, after providing \$35 million for reconversion and plant rehabilitation costs incident to the defense emergency, was \$506 million. The amount earned on the common stock, after deducting dividends of \$13 million paid on the preferred stocks, was \$493 million. In 1950 net income was \$834 million and the amount earned on the common stocks was \$821 million.

In spite of a substantial decrease in net income, General Motors provided the largest taxes in its history in 1951. Provision for United States and foreign taxes on income totaled \$983 million, including \$177 million for excess profits taxes. Provision of \$158 million for other 1951 taxes, including state and local taxes and the company's share of social security taxes, made GM's total 1951 tax bill \$1.141 billion.

Overdrive Adopted for Plymouth Cars

Plymouth Div. of Chrysler Corp. recently announced the adoption of an overdrive transmission. It will be offered as optional equipment at extra cost on all models.

1952 NEW TRUCK REGISTRATIONS*

Arranged by Makes in Descending Order According to the January 1952 Total

MAKE	January 1952	December 1951	January 1951	Per Cent of Total	
				January 1952	January 1951
Chevrolet	19,455	20,806	29,314	32.61	33.32
Ford	12,996	16,138	20,899	21.77	23.73
Dodge	7,979	7,487	10,730	13.27	12.19
International	6,650	5,586	8,121	11.15	9.22
G. M. C.	5,969	6,081	8,967	10.00	10.18
Studebaker	2,114	2,180	3,195	3.54	3.63
White	948	720	1,277	1.99	1.45
Willlys Truck	897	949	1,673	1.80	1.90
Willlys Jeep	581	828	864	.97	.78
Mack	536	538	1,005	.90	1.14
Diamond T	288	249	407	.48	.46
Divco	254	165	408	.43	.46
Reo	239	196	397	.40	.45
Autocar	142	133	189	.24	.21
Brockway	117	103	267	.20	.30
F. W. D.	76	38	38	.13	.04
Pontiac	74	72	86	.12	.10
Federal	52	61	112	.09	.13
Kenworth	47	25	74	.08	.09
Sterling	29	23	45	.05	.05
Peterbilt	19	11	22	.03	.02
Misc. Domestic	189	201	127	.32	.14
Misc. Foreign	20	14	21	.03	.02
Total—All Makes	59,661	62,596	98,058	100.00	100.00

* Based on data from R. L. Polk & Co.

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Record Breaking Attendance at ASTE Industrial Exposition

With more than 35,000 registrations and a total attendance well over 100,000 the American Society of Tool Engineers 1952 Industrial Exposition which was held in the Chicago International Amphitheatre March 17 to 21 was the most successful ever held by the ASTE. The number of registrations exceeded preliminary estimates by about 10,000. There were about 400 exhibitors.

Tuesday night, March 18, a fire in the South Hall on the second floor of the Amphitheatre destroyed 14 exhibits. Total damage was estimated at close to \$750,000. However, despite this large property loss, new booths, furniture and equipment were installed in the exhibits before the exposition opened at 9 a. m. Thursday morning.

The following ATSE officers were elected at a meeting held March 18: President—L. B. Bellamy, Detroit manager of Sterling Grinding Wheel Div., Cleveland Quarries, Detroit; First Vice President—Roger F. Waindle, partner and director of research, the Nugent-Sand Co., Inc., Muskegon, Mich.; Second Vice President—J. P. Crosby, vice president of LaPointe Machine Tool Co., Hudson, Mass.; Third Vice President—Dr. Harry B. Osborn, Jr., technical director of TOCCO Division, Ohio Crankshaft Co., Cleveland; Secretary—H. E. Collins, chief production engineer, Hughes Tool Co., Houston, Tex.; Assistant Secretary-Treasurer—Gerald A. Rogers, Rudel Machinery Co., Ltd., Montreal, Canada. Howard C. McMullen, plant manager, the Philco Corp., Bedford, Ind., was reelected Treasurer. H. E. Conrad, American Society of Tool Engineers, Detroit, is Executive Secretary of the Society.

General Electric Dedicates Lockland Jet Plant

"The Fastest Ten Years in History" was the theme of the two-day dedication ceremonies that officially opened the new General Electric jet engine plant at Lockland. Located outside of Cincinnati, the Lockland plant is in production on the J-47 jet engine for the military. Announced along with the plant opening was a new jet—the J-47-GE-27, which is said to provide 10 per cent more thrust than its predecessor. It has a thrust rating in excess of 5800 lb compared with the more than

5200 lb previously announced for earlier models.

During the two-day event, General Electric delivered to the Air Force the 10,145th jet engine the company has produced. This marked the 10th anniversary of the aircraft gas turbine industry in the U. S. Included in the engines produced by G. E. during the past decade was America's first jet engine, the I-A, which initially ran on March 18, 1942, and which powered the first American jet airplane, the Bell P-59 Airacomet. Engines produced since include such models as the I-16, J-33, J-35, and the J-47. There are other more powerful engines which are currently in the testing stage. It is believed that at least one of these engines will be in the 10,000-lb thrust range.

1951 Mexican Vehicle Output Doubled That of 1950

The rapid growth of the automobile and truck assembly industry in Mexico is revealed in production figures recently released by the Mexican Government. These figures show that in the past year production has doubled that of 1950, which had shown sharp

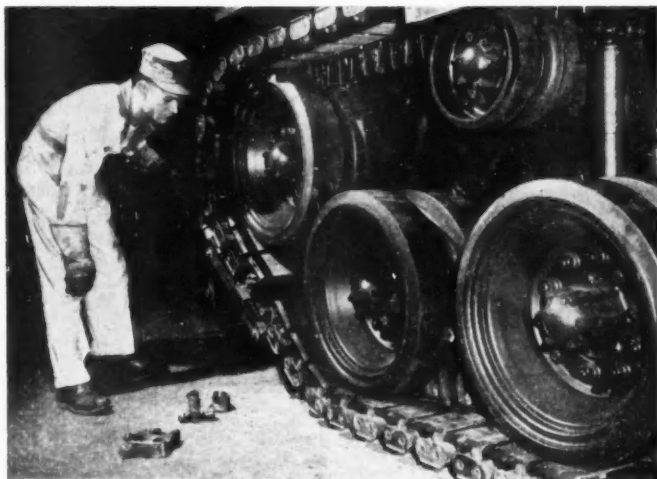
rises over previous years. In less than 10 years the country has been able to increase by 400 per cent the volume of the industry.

According to the official figures, Mexican assembly plants produced 23,402 automobiles in 1951, as compared with 10,519 units in 1950. Truck assembly totaled 22,070 for 1951, almost double the 11,709 units produced in 1950.

Nash Increases Prices on Two 1952 Models

Nash Motors Div. of Nash-Kelvinator Corp. announced a factory list price increase for its new 1952 Ambassador four-door super sedan of \$99.20, plus \$91.10 previously allowed by the Office of Price Stabilization on 1951 models.

Factory list price on the new 1952 Nash Statesman four-door super model has been increased \$117.30, plus \$72.55 previously approved by OPS on 1951 models. The new factory list price on the Statesman model is \$1981.85, and the 1952 Ambassador is \$2327.40. Other Statesman and Ambassador models have been increased by approximately the same amounts.



EASY TANK TRACK INSTALLATION

Engineers at the Detroit Tank Arsenal have developed a clever device for installing tracks on the M-47 tank. It consists essentially of a double thread jack driven by an air motor. Lugs on the jack grip both ends of the track, and when the motor is started it brings the two ends into position for locking.

Men in the News

Custom illustrated appointments and changes on basis of telephone conversations and file supplies



Ross Gear & Tool Co.—John E. Jarrell has been elected president.



General Motors Corp.—Albert F. Davis has been named works manager of GM's Detroit Diesel Engine Division.

Ford Motor Co., Lincoln-Mercury Div.—Robert R. Nadal has been promoted to manager of product sales and service, while A. H. Crowley has been named manager of product promotion and distribution.

Vickers, Inc.—Edward J. Doucet, Jr., has been advanced to advertising manager.

Packard Motor Car Co.—Neal K. Fennell has been appointed coordinator of public relations.

Ford Motor Co., Ford Div.—Walter G. Nelson has been named to the general manufacturing staff.

Willys-Overland Motors, Inc.—William J. Borth has been appointed to special assignment duties.

The Garrett Corp.—Charles T. Leigh has been named to the board of directors, succeeding John G. Hormel, who resigned.

AiResearch Manufacturing Co.—Claude N. Monson was elected vice president and manager of the company.

Consolidated Vultee Aircraft Corp.—H. W. Rickert has been appointed assistant division manager for administration of the Convair Guided Missile Division.

Aluminum Company of America—Harold C. Erskine, manager of the Cleveland works, has been named to the post of assistant division manager for ALCOA's die casting operations.

United States Steel Co., American Steel & Wire Div.—James W. Ramsey has been appointed assistant to general traffic manager.

The National Screw & Mfg. Co.—Donn D. Greenshields, vice president since 1949, has been elected a director of the company.

General Motors Corp.—George A. Zink, since 1943 works manager of the Detroit Diesel Engine Division of GM, has been made assistant general manager of the Fabricast Division of GM at Bedford, Ind.

Minnesota Mining and Manufacturing Co.—G. G. Willson was appointed manager of the Technical Service section of the coated abrasives laboratory.

Pangborn Corp.—Arthur J. Buckley has been named assistant sales manager.

Reynolds Metals Co.—W. T. Ingram has been appointed general sales manager of the Pacific Coast Region.

Continental - Diamond Fibre Co.—Harry K. Collins has been named director of manufacturing.

Consolidated Vultee Aircraft Corp.—General Joseph T. McNamee (ret.) has been elected president.



General Motors Corp.—Nelson C. Desendort has been made general manager of GM's Electro-Motive Division at La Grange, Ill.



Link-Belt Co.—Raymond S. Wood has been appointed general manager of the Company's Ball & Roller Bearing Plant in Indianapolis.



Kearney & Trecker Corp.—Orrin W. Barker, assistant chief engineer since 1936, was recently named chief engineer.

(Turn to page 108, please)

Necrology

L. Ray Buckendale, 59, vice president in charge of engineering of Timken-Detroit Axle Co. and a past president of the Society of Automotive Engineers, died March 6, in Detroit, Mich.

Alanson P. Brush, 74, developer of the Brush runabout, organizer of the old Oakland Motor Co., and former Buick engineer, died March 6, in Detroit, Mich.

Robert H. Duff, 54, assistant chief engineer for Dodge Truck Div. of Chrysler Corp., died March 5, in Detroit, Mich.

Frank A. Burt, 96, who assisted in the development of the old Cannon automobile in 1903, died March 8, in Kalamazoo, Mich.

Auguste Pineau, former supervisor of the Experimental Model Shop at AC Spark Plug Division of General Motors and a well-known figure in the American and European automotive fields for some 50 years, died recently in Flint, Mich.

Frederick William Pickard, 80, a director and former vice president of E. I. duPont de Nemours & Co., Inc., died March 7, in Wilmington, Del.

Heyman Rosenberg, 78, founder of the Parker-Kalon Corp., died on Feb. 29, in Hollywood, Fla.

Franklin Churchill Edson, 69, retired president and chairman of the board of the Asbestos Manufacturing Co., died in Pelham, N. Y., on March 1.



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Since machining is probably the most widely used method of producing hollow parts from steel tubing, keeping well-informed calls for periodic review of the characteristics of tube machining operations and new developments in this field. A new slant on types of tubing, grades of steel, mechanical properties and dimensional tolerances could show you the way to reduce overall time and costs.

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product, dimensional accuracy and type of surface finish required.

Send along a print if you like.

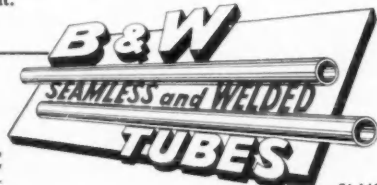
The B&W Technical Staff will supply objective recommendations and, if you desire, your regional B&W Tube Representative—Mr. Tubes—will step in to help interpret your needs to the home office. Bulletin TB-324 gives an idea of what can be done with fine tubing. Write for it.

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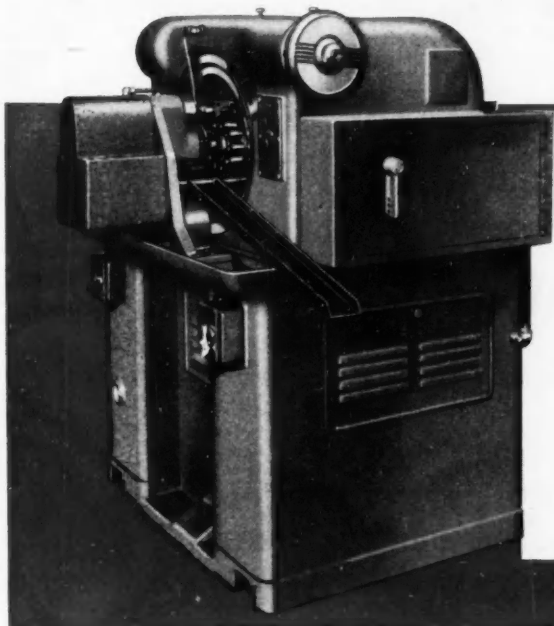
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**NAMCO TRIPLE ROLL
HYDRAULIC
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with Magazine Feed
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This precision high-production machine is the perfect answer for makers of instrument, aeroplane or automotive dry-seal parts for the defense program. Thread lengths greater than twice the diameter can be produced smoother, faster—and with a greater saving in materials and man-hours than by any other method.

The Namco Thread-Roller operates on either the plunge-cut or the feed-through principle, with interchangeable two-roll or three-roll heads and straightline support. Class 3 fit and unsurpassed finish (superior to ground-thread production) are characteristic.

Capacities range from $\frac{3}{8}$ " up to $1\frac{1}{2}$ " using three rolls—and $\frac{1}{8}$ " to $\frac{3}{8}$ " using two rolls. Because of its three-roll operation and three-point support, which eliminates distortion, the machine is a "natural" for hollow work.

To save additional man-hours and permit the use of unskilled labor, magazine feed and hydraulic loader are available. This combination makes the Namco Thread-Roller the fastest, most versatile, most accurate, *most economical* means of thread production available today. Send us samples of the jobs you want to do; we'll do the rest—in quoting you on your requirements.



Ask us for your copy of this twelve page bulletin (TR 49) giving complete details on the Namco Thread-Roller.

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NEW PRODUCT DESIGNS DEMAND NEW MACHINING METHODS

This New Britain Automatic developed for contour facing jet compressor wheels

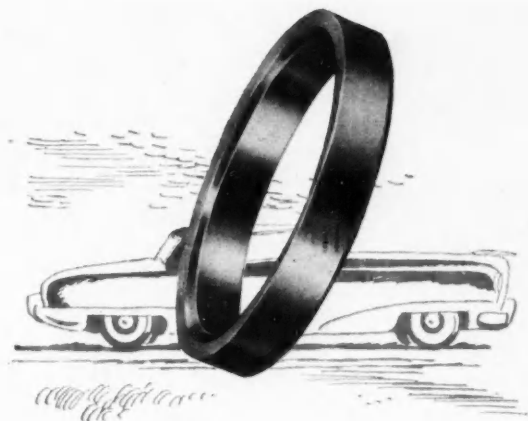
**AUTOMATIC BAR AND CHUCKING MACHINES • PRECISION BORING MACHINES
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NEW BRITAIN

Automatics

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All are factory-fresh, assured by prompt deliveries from the many Exide manufacturing and assembly plants located throughout the country.

Years of research-engineering are back of Exide Batteries. This development goes on and on, for Exide advances keep pace with current needs, providing batteries you can count on for dependable performance, long life and low cost per mile of operation.

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STARTING POWER

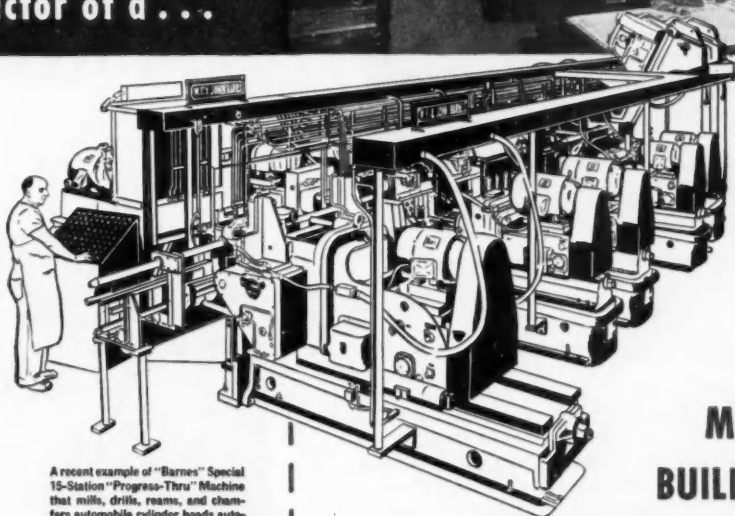
for light, medium or
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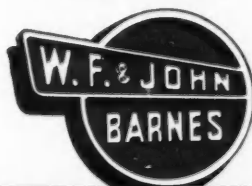
Partial view of Special Machine
Engineering Department at Barnes.



A recent example of "Barnes" Special
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that mills, drills, reams, and chamfers
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MULTIPLE SPINDLE DRILLING, BORING, TAPPING MACHINES - AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES



Final assembly of Allison CD-500 transmissions for Walker Bull-Dog tanks. Attention is drawn particularly to the unusual design of turnover stands, providing easy accessibility for various assembly operations. The track at the left is used for returning empty stands.

ALLISON Div. has been in full production on torque converter type transmissions for Walker and Patton tanks from the inception of the current tank program, in keeping with production schedules outlined by Ordnance. Allison is particularly proud of the fact that no tank was ever delayed through lack of their transmissions.

Some impression of the amount of detail involved in the manufacture of these units may be gained from the fact that the "CD 850" for General Patton tanks is composed of some 4000 parts, while the "CD 500" for Walker Bulldog tanks requires a total of 5400 parts. In many respects their manufacture is akin to that of building aircraft engines in WW II from the standpoint of quality control, fine tolerances, and relatively low production volume. However, manufacturing is even more involved due to the fact that the transmissions have relatively few multiple or interchangeable parts.

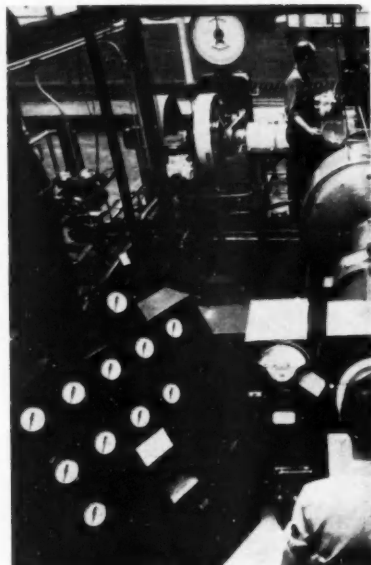
By Joseph Geschelin

Just as in the case of aircraft engines, the tank transmissions have been meticulously combed for weight reduction. As a result the weight of the CD 500 unit was reduced by

some 400 lb from the original engineering design before it was released for production.

Launching of the "500" transmission for Walker tanks is a story in itself. Allison had the basic design and test units available early in 1950 but no production orders. Then in September, 1950 oral instructions were received from Ordnance to the effect that a certain number of production units were required for delivery in February, 1951. Although no tooling or manufacturing equipment was available at the time, Allison set up an extensive pilot line operation at Plant 3 producing the majority of the parts. However, it was necessary to set up a pilot line on cases and covers in conjunction with Allison aircraft engine operation at Plant 5 to meet the early production schedule. By sheer weight

What it Took To Put Allison



Testing of transmissions involves an enormous mass of equipment and instrumentation in

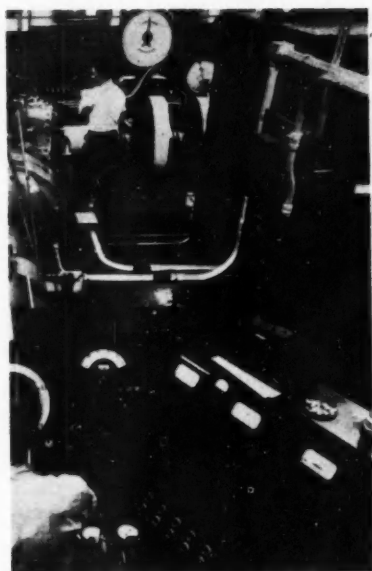
of will and skilled manpower the transmissions were delivered on time and well ahead of initial tank production.

At the same time the management went all out to set up suitable production facilities to meet Ordnance schedules. By then the defense program was rolling and machine tools of standard or special types hard to get. The plunge was made, however, by selecting some 500 machine tools from Ordnance warehouses. Unfortunately, these machines not only were old but in a

Many Difficulties Had to Be Overcome to Meet Schedules. This Article Also Gives a Resume of the Unusual Machining Operations

Tank Transmissions

in Full Production



view of the involved test procedure. Above is a perspective of one of the numerous stands.

sad state of disrepair. Before they could be used for any purpose they had to be completely torn down, parts replaced, and rebuilt. Even then many of the necessary parts were not available and had to be manufactured in the tool room.

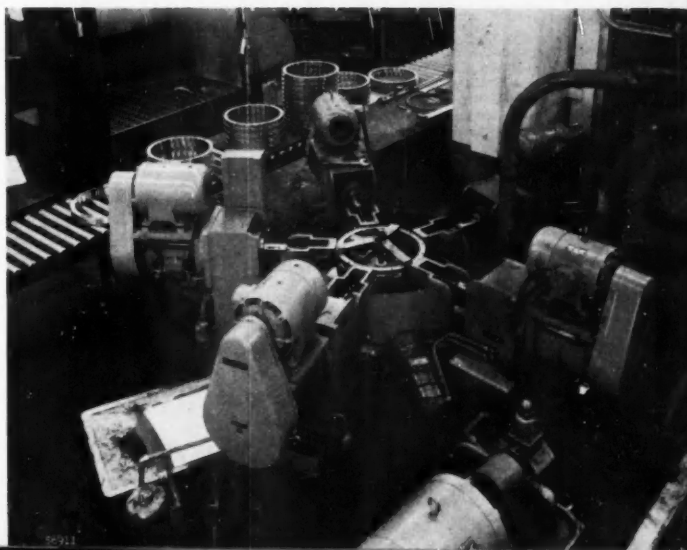
What made the machinery rebuilding project so difficult was the fact that neither Allison nor the area about Indianapolis had a sufficient quantity of available skilled mechanics capable of doing this exact-

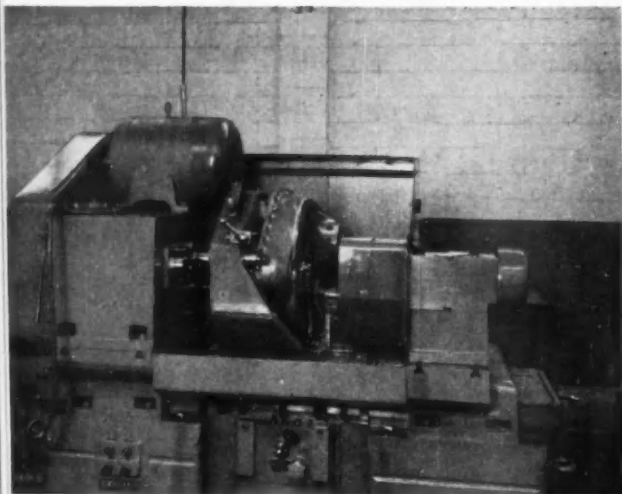
ing job. It became necessary to recruit unskilled workers and train them painstakingly but quickly to the various tasks. That this was accomplished is a tribute to the skill and energy of the Allison management team.

Meanwhile there arose the problem of where to find the floor space for producing the transmissions. For by this time Allison was engaged in jet engine production expansion and floor space was at a premium. Fortunately a complete plant was found in another corner of Indianapolis. Abandoned for many years and serving at times as a warehouse, this plant was of World War I vintage, originally operated as a division of Fairbanks-Morse.

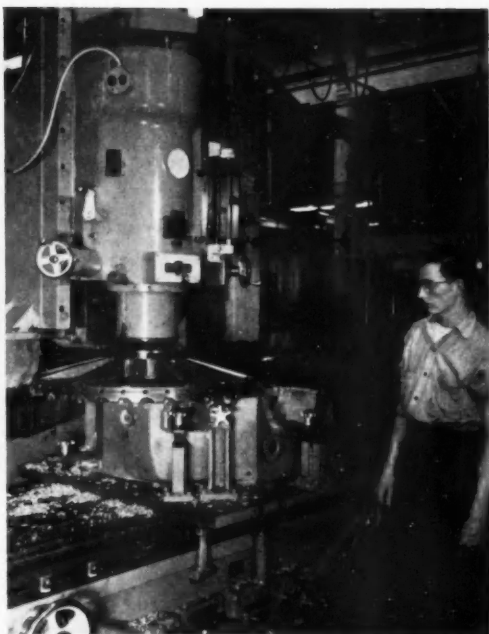
The plant was acquired without loss of time, then subjected to a complete rehabilitation program—replacing the heating system, plumbing, and water supply. Walls, ceilings, and floors were rebuilt and a semblance of good housekeeping restored. In addi-

One of several special Cross drilling machines is used for drilling 30 holes in the periphery of the reverse ring gear, through the groove. As shown, it is a five-head machine, requires six indexings of the work to produce 30, $\frac{1}{16}$ in. diameter holes.

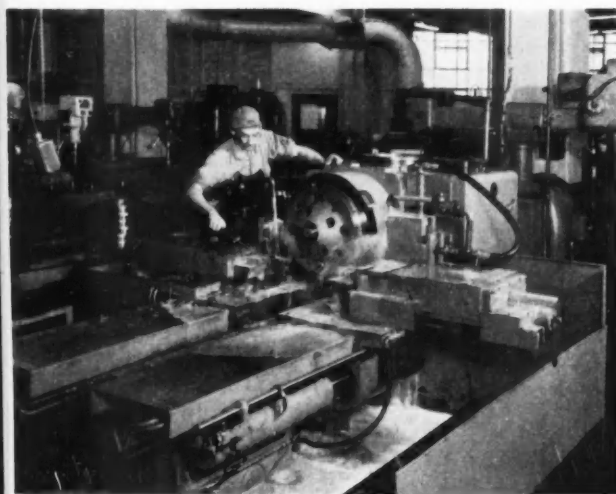




Ex-Cell-O has installed several noteworthy precision-boring machines, the one illustrated here being tooled for boring the center bore of the cover; a side bore and one face; and a side bore on the opposite face. The 4.437 in. diameter is held to plus 0.001, minus 0.030; while the 1.993 in. diameter is held to plus 0.002 in., minus 0.000.



One of the basic machining operations on the case is finishing of the split line in the Cincinnati Hydro-Tel, seen here. This face is held to 0.002 in. for flatness; minus 0.005 in., plus 0.000 for parallelism with the cover face.



The reverse ring gear, one of the major detail parts, is turned from a steel forging in two operations in the latest type Gisholt Model 24 automatic lathe. For finishing, illustrated here, it is fitted with two sets of tool blocks for turning the OD and wide groove. The 19-1/16-in. OD is held to a tolerance of 0.002 in.

tion, a system of modern lighting was installed.

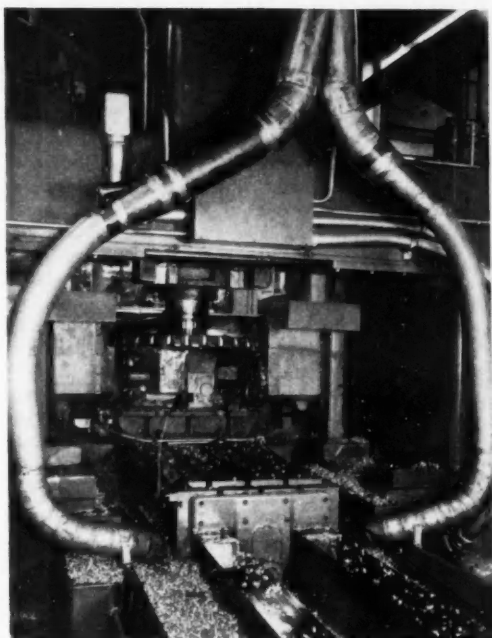
A brief article which appeared in *AUTOMOTIVE INDUSTRIES*, October 1, 1951 emphasized particularly the installation of Pratt & Whitney profilers; and the Buhr transfer machine on the case, in what is known as Allison Plant 7. Both were "firsts" and the Buhr machine was the first application of a

transfer machine in this type of manufacturing.

Today the operation is in full swing. Plant 7 handles the machining of most of the parts for the CD 500 transmission. Plant 3, meanwhile, has been expanded to handle the manufacture of "850" transmissions, the making of gears and certain other parts for both transmissions, the final assembly and block testing of all transmissions. In addition, Plant 3 recently completed installation of one of the most modern and most extensive heat treating departments to be found in the industry. We plan to publish a summary of the heat treating facilities in *AUTOMOTIVE INDUSTRIES* in the near future.

The entire operation is so extensive as to defy condensation in an article. Consequently, we have confined this article to a highspotting of some unusual operations on a few of the major parts. Together with suitable illustrations, this treatment will provide the reader with a perspective of the activity.

Consider now some highlights on the RH and LH housing machine lines. Incidentally, these big aluminum castings lose considerable weight in the process. The left hand housing, weighing 182 lb in the rough, comes out at 148 lb fully finished. The right hand case section, weighing 148 lb in the rough,



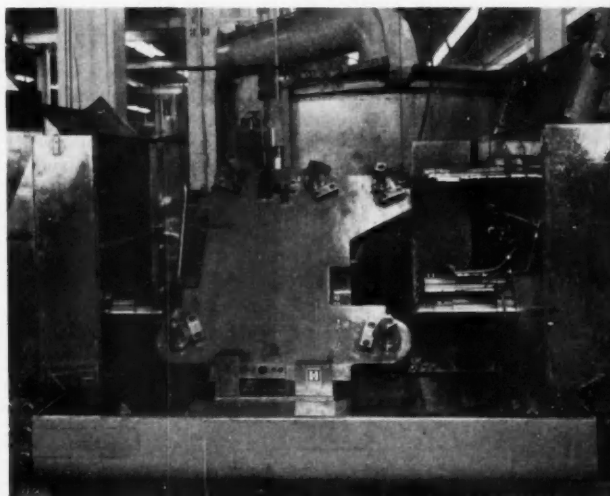
Sundstrand Triplex mill is used for milling the cover face and two sides of case halves. A unique feature of this setup is found in exceptionally fine tolerances for heavy milling—dimensions being held to 0.005 in.

trims down to 137 lb after it is machined.

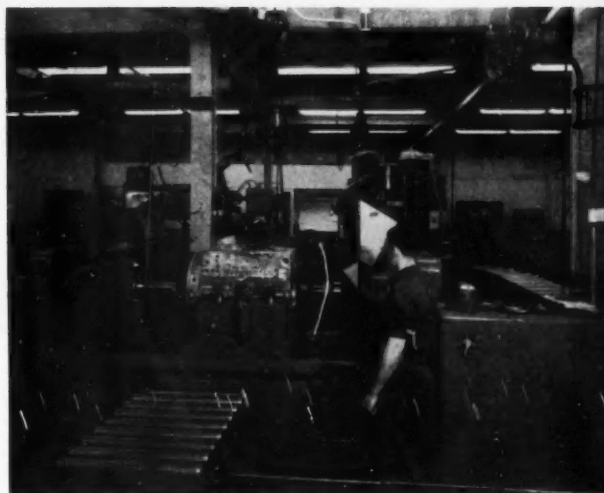
Aluminum case sections are received in the rough from the Fabricast Division in Bedford and after some preliminary operations are qualified 100 per cent in big target fixtures to assure conformity to machining specifications. In addition, all housings are pressure tested and must be capable of holding pressures up to 200 psi in oil passages. Since publication of the initial article in *AUTOMOTIVE INDUSTRIES*, Allison has installed additional Pratt & Whitney profilers and some of these are employed for rough-finishing the split line of the two housings, an important function for succeeding operations.

While heavy milling machine operations are not a novelty, the big Sundstrand Triplex mill, illustrated here, is unusual in view of the tolerances specified for the job. As shown, the fixture handles a pair of halves at a time, milling the cover face and two sides of each part. Milling is held to plus or minus 0.005 in., while the length of the case, measured from the center line, is held to plus or minus 0.005 in.

Next the split line is finished in a Cincinnati Hydro-Tel to provide the exact location for all succeeding operations. When the part comes out, this face is held to 0.002 in. for flatness and within



An example of precision-boring is seen in this view of a two-way Model 522 Heald Bore-Matic. It is shown without the case in place to emphasize the features of the massive fixture and the multiple-tooled boring spindles.



One of the out-sized Heald Bore-Matics, shown here, is tooled for line-boring four bearing bores from one side; and one bore from the opposite side.

minus 0.005 in., plus 0.000 in. for parallelism with the cover face.

From this point on the machine shop bay is divided into two parallel lines, one for each case half. In addition to the items of equipment to be noted here, the plant boasts a wide variety of radial drills, Baush drills and radial tappers, a variety of K & T mills, Natco way-type drilling machines, Barnesdril machines, etc.

During the stages of machining, each half is

located in fixtures which depend upon the finely finished split line and two construction pins for positive and accurate location.

Among the major items of equipment are found out-sized examples of Heald Bore-Matics for various precision-boring operations. One of these is tooled for line-boring four bearing bores from one side of the LH case, and one bore on the opposite side. Each station is fitted with multiple tooled spindles.

As the case halves are completed, they converge

for an operation of this kind. Specifically, the faces are held square with the split line within 0.002 in.; each face is held to 0.005 in. from the center; while the overall length— $24\frac{3}{8}$ in.—is held to plus or minus 0.005 in.

A neat example of precision-boring is found in the finish-boring of the bearing line in the assembly, in a Heald two-way Model 522 Bore-Matic. Two of the bores are held to 0.0008 in., while one is held to 0.001 in. On the opposite side, the machine bores a blind end hole, 20 in. in diameter; and bores a $19\frac{3}{4}$ in. hole at the same time. On the 20 in. bore, diameter is held to plus or minus 0.010 in., while depth is held to plus 0.005, minus 0.000 in. The $19\frac{3}{4}$ in. bore is held to plus 0.002, minus 0.000 in. on diameter.

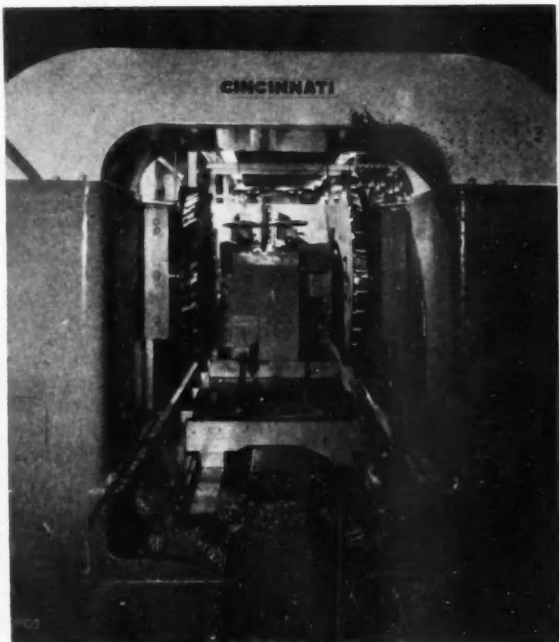
These several examples should indicate to the reader the high order of precision demanded in the manufacture of the big case. In addition to the case, the assembly also includes two covers and plates, machined on parallel lines. Illustrated here is one of the Ex-Cell-O precision-boring machines on the cover. The setup does the boring of the center bore and a side bore on one face; and a side bore on the opposite face. That this job is exacting may be gained from the fact that one stepped bore demands the following tolerances: 4.437 in. diameter, held to plus 0.001 in., minus 0.000 in.; 1.993 in. diameter held to plus 0.002 in., minus 0.000 in.

Another Ex-Cell-O precision-boring machine, this one tooled for handling a plate, bores a blind end hole in a surface of $6\frac{3}{8}$ in. diameter. The bore is 0.281 in. deep, held to plus 0.005 in., minus 0.000 in.; while the surface must be flat within 0.001 in.

These enormous transmissions require considerable gearing, too extensive to be considered at this time. One example is the reverse ring gear which is turned from a steel forging in two operations in the latest type Gisholt Model 24 automatic lathe. In the finishing operation, illustrated here, the Gisholt is fitted with two tool blocks, one on each side of the head, for turning the OD and groove. The $19\frac{1}{16}$ -in. OD is held on this machine to a tolerance of 0.002 in.

Later this ring gear has 30 holes drilled in the periphery through the external groove, and has 30 internal gear teeth cut by broaching. Drilling of 30 holes is done in the special Cross machine shown here. It is a five spindle machine, hence requires six indexings of the work to produce the 30, $\frac{5}{8}$ in. holes.

The gear teeth are cut by surface broaching in a large LaPointe V-8, vertical pull-down type broaching machine. The broaching tool cuts three spaces at a time, the work being indexed after each cycle
(Turn to page 78, please)



This is the second of two large Cincinnati Duplex milling machines on the case. The two, 36-in. diameter milling cutters finish the cover faces to exceptionally close tolerances. They are held parallel with the split line to 0.002 in.; each face held to 0.005 in. from the center; while overall length— $24\frac{3}{8}$ in.—is held to plus or minus 0.005 in.

to a large inspection station where they are checked 100 per cent before being accepted for assembly. Accepted parts then are transported to the assembly station where the two halves are bolted together for machining as a single case.

One of the first steps after assembly is the drilling of 120 holes of various sizes in a three-way Natco special-purpose drilling machine. Later the case enters the second of two large Cincinnati Duplex type milling machines where the cover faces are milled to extremely fine tolerances, using two, 36-in. milling cutters with inserted cemented-carbide blades. Here again we find exceptional accuracy

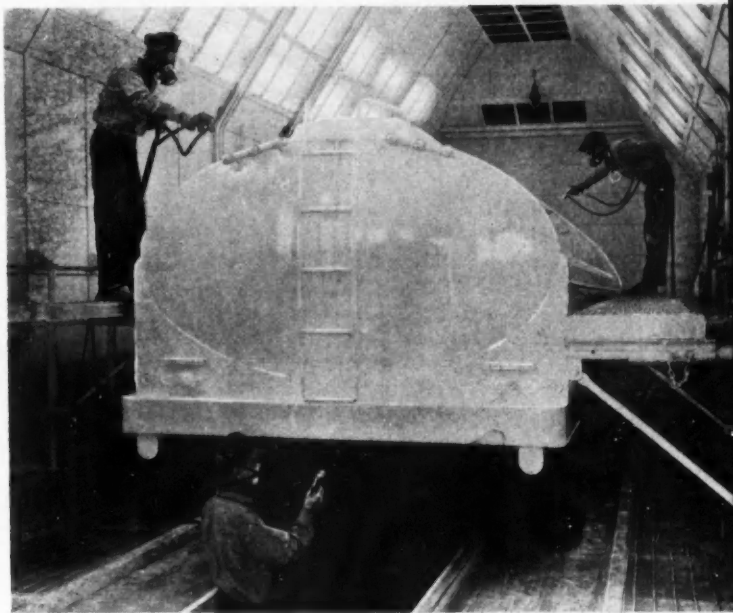
Modern Facilities for Painting Tank Trailers

THE illustrations shown here are intended as highlights of the modern paint shop installation recently completed for painting tank trailers at the Omaha Tank Div., Fruehauf Trailer Co.

First the tank is cleaned by the application of dilute hydrochloric acid, followed by an air blow. Not only does this produce a chemically clean surface but one which is etched to promote paint adherence. Painting procedure includes the application of a single prime coat, followed by three coats of synthetic enamel. Both primer and synthetic enamel are of quick air-drying type, permitting the application of successive coats without baking between coats.

Final drying, however, is done in the 50-ft long oven illustrated here. It is held at a temperature of 150 F for the drying cycle time of three hr. The oven, designed and built by Fruehauf, is heated by an oil furnace, heat is circulated by fan blowers and incoming fresh air is filtered through spun glass filter elements. The oven, which is adjacent to the spray booth as shown, is sealed off by means of double doors with two ft of dead air space between the doors.

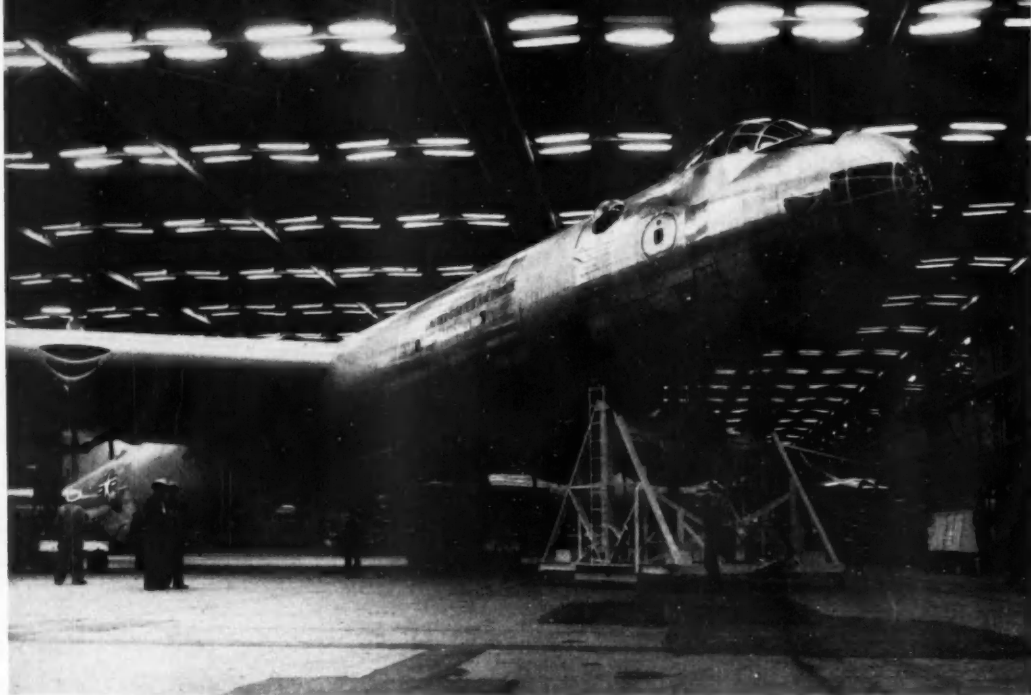
The paint spray booth, which is also 50 ft long, is provided with a large capacity exhaust ventilating system to remove solvents and paint overspray.



Following cleaning, the tank trailer moves into the big spray booth where the operators apply successively—the prime coat and three synthetic enamel coats.

Simultaneously drying of all four coats is done in this drying oven. Installed immediately adjacent to the spray booth, it permits the vehicle to be moved into the oven as soon as the paint operation is completed. The entrance is sealed from the spray booth by double doors. Drying takes three hours at a temperature of 150 F.





An RB-36 reconnaissance plane ready to be pulled off end of final assembly line. As planes near completion, they are set at an angle to permit their 230-ft wingspan to move in the 200-ft-wide bay. Before moving a B-36 out through the assembly building door, workers jack up nose of plane until 47-ft-high tail has been lowered sufficiently to clear roof trusses.

Convair's Fort Worth Plant Is 4000 Ft Long and 320 Ft Wide for Most of Its Length, with Two 40-Ft-High Bays 200 and 120 Ft Wide. Even with Facilities of Such Dimensions, Special Handling is Necessary When Building the Extremely Large B-36 Planes.

Building

BECAUSE of the enormous size of almost every part and component that goes into the giant B-36 bomber extraordinary space must be provided in the assembly building; work stands, jigs and fixtures must be proportionately outsized; and the transporting of parts from fabrication areas into station becomes a major operation.

Convair's Fort Worth division, although originally designed as an assembly facility for B-24 Liberator bombers, is well-proportioned for the B-36 production job. This plant is 4000 ft long and 320 ft wide for most of its length, with two 40-ft-high bays, 200 and 120 ft wide.



Hat section structure of pilots' enclosure being located and clamped in preparation for spot welding. This structure, entirely of stainless steel, is cross hatched to controlled dimensions so that the glass will fit properly.

By B. G. Reed

Assistant Division Manager
in Charge of Production
Fort Worth Div.,
Consolidated Vultee
Aircraft Corp.



Overall view of B-36 nose-forward bomb bay primary line, with a pilot's enclosure being installed on nose structure in background. Aft section of bomb bay mated to tail, with horizontal stabilizer and dorsal fin attached, are shown in the foreground.

World's Biggest Bombers

The tooling department and parts plant are adjacent to each other, located just west of the assembly bay. Tooling is housed in a two-story arrangement with the ground floor used for the heavy machine tools employed in making production tools.

The upper section or second floor of the tooling department is used for the making of templates, form blocks, and the like, employing light machinery.

Raw stock is fed to the fabrication area from adjoining materials warehouses. In this area are applied the various processes for making up the detail parts for subassembly—shearing, forming, drawing, stretching, anodizing, heat treating, painting, and welding. One process of which Convair is particularly proud is Metlbonding, in which metal surfaces are stuck together with a combination of cement and adhesive tape, and then bonded by applying low pressure while the parts are heated.

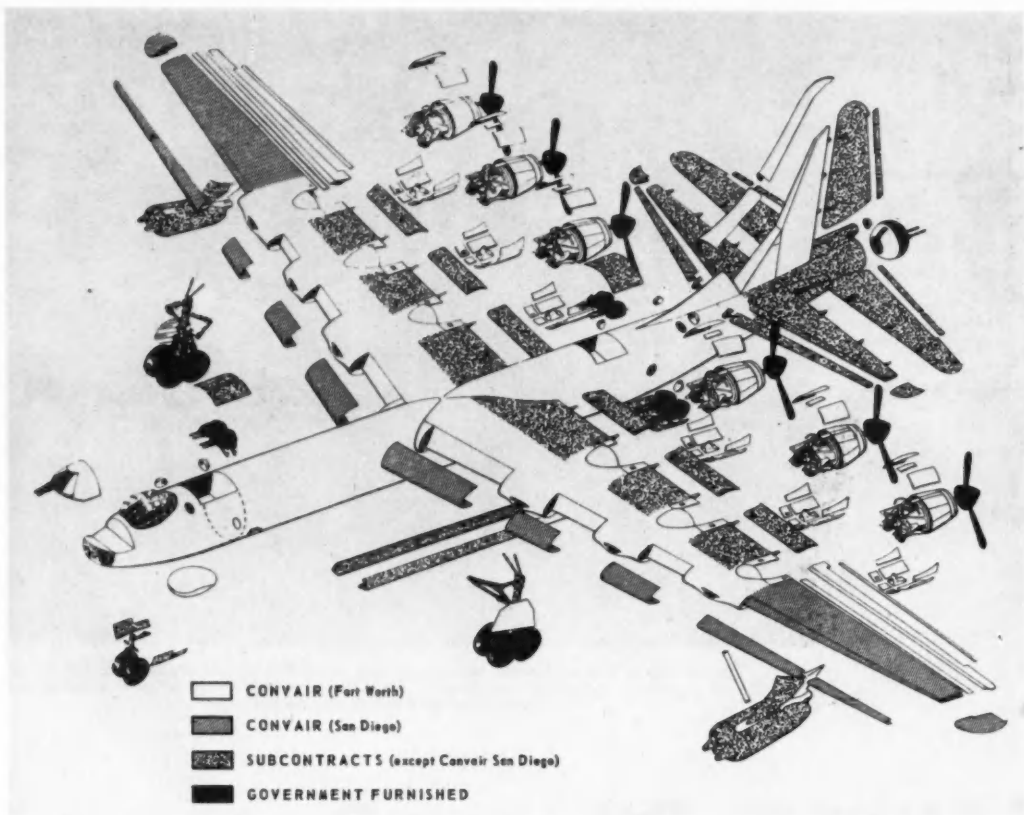
From warehouse to fabrication to major assembly, the flow is across the width of the building to the straight 4000-ft assembly line, which begins with major assembly. From here the fuselage and wing

components go forward to major mating stations and on to the 11-station final assembly line. Adjacent and parallel to the final assembly line are the areas for build-up of components installed along the line. In addition to these feeding areas, parts come into the line from a subcontract parts warehouse. The final three stations of the line are used for checks of the various systems—electrical, hydraulic, and armament—and for Air Force inspections.

When a B-36 leaves the assembly line, it is towed to various check stations outside the plant for testing of guns, radar, compass and engines. Then, after flight testing and Air Force acceptance flights, it is returned for installation of loose equipment such as bomb racks, turret and engine covers, and finally to the delivery row ready for the Air Force to take over.

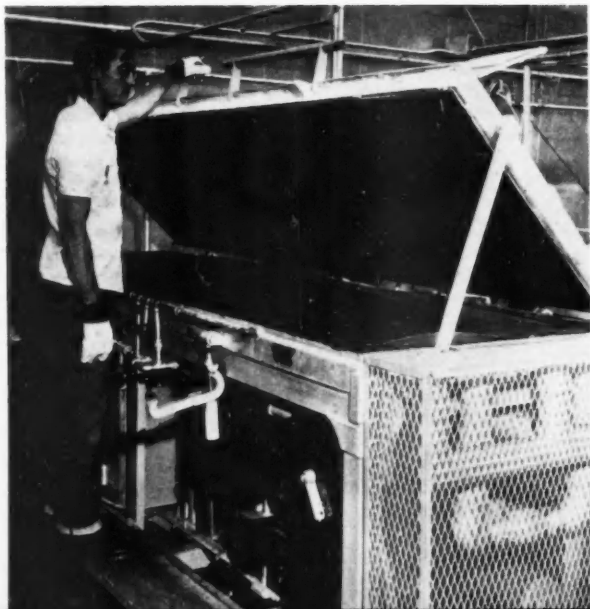
The entire design and production effort requires a working force of approximately 30,000 employees, more than half of whom are in the factory. The 1951 payroll was in excess of \$100 million.

Convair has broadened its subcontracting base to include 1610 subcontractors and suppliers in 36 states



This exploded sketch of a Convair B-36 bomber indicates the origin of parts and components. In addition, there are hundreds of purchased items, most of which are installed in the interior of the plane. Transparent plastic domes are among the half-dozen purchased parts which appear on the exterior of the airplane.

Metal surfaces of the B-36 "skin" receive low vacuum pressure and heat in this giant presser to bond the surfaces together. This bonding process was developed at Convair's Fort Worth division.



furnishing parts, materials and services. These are in addition to suppliers of Government-furnished equipment such as the engines, wheels, and armament. The dollar volume of subcontracting and purchases in the Fort Worth-Dallas area alone amounts to approximately \$3 million a month.

The problems of the B-36's size and resulting transportation difficulties are highlighted in Convair's subcontracting program. A custom-built 91-ft trailer-truck was required for hauling horizontal stabilizers from the subcontractor in Dallas to Convair's Fort Worth plant. Rudders are hauled, one at a time, in a low-slung truck from the Luscombe plant at Garland, 20 miles northeast of Dallas. Jet pod assemblies arrive in another specially-built truck from Bell Aircraft's North Fort Worth plant. And tail cones are shipped in, two at a time.

on a custom-built truck which travels at low speed all the way from AVCO's Nashville plant.

The B-36 components are so big that the space problem even in a plant the size of Convair's Fort Worth division remains a major one. Even the 200-ft assembly bay is too narrow for the B-36 final assembly line without certain adjustments. When outer wing panels are hung, it becomes necessary to set the airplane at a 45-deg angle on the line to make room for the 230-ft wing span. And when the rudder assembly is hung, it is necessary to jack up the nose of the B-36 a distance of 10 ft to bring the vertical fin down low enough to clear overhead roof trusses during line moves.

The B-36's very size has its production advantages, too. There is more "head room" to work in. Wiring and other intricate installations within wing and fuselage areas become relatively simple from a space standpoint. Workers can crawl right into wing areas of the B-36 whereas they must reach and probe in the thin wings of a fighter to make comparable installations.

A fairly obvious advantage of the integrated assembly line is that it is conducive to smooth production flow, easier to control than one in which parts must arrive from half a dozen different buildings. Traffic time is saved and production bugs are ironed out more quickly.

The overhead monorail system at the Fort Worth plant is perhaps the greatest single boon to production. Without it, two or three times more space would be required to move huge components from place to place. By eliminating lateral movements on the line, assemblies can be placed side by side. When they are ready for installation, they are lifted vertically and carried to the proper station.

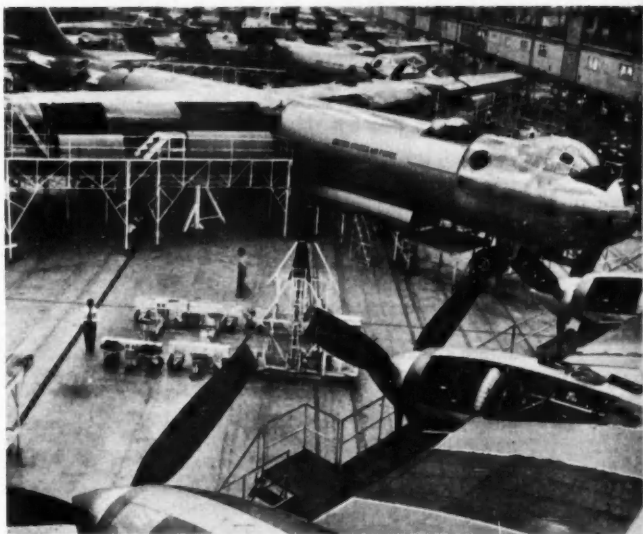
Consider the 28,000-lb center wing section for example. Four monorail cabs, three of five-ton capacity and one of 15-ton capacity, are used to move it into the mating station.

The fuselage is moved in two sections, the nose and forward bomb bay comprising one section and the aft bomb bay and tail the other. Two five-ton cabs are used on each of these sections. Each of the fuselage components must be moved five

(Turn to page 82, please)



Bomb bay doors, main landing gear doors, wing leading edge stubs, tables, and furnishings are installed at this station on the line.



Jet engines are installed, engine cleanup is begun, and all surface controls are rigged and completed at this assembly station.



Subassembly and major assembly of B-36 bomb bay. At upper right are major assembly fixtures for bomb bay truss structure and bomb bay itself. The area in foreground and at left is for subassembly.

IT WAS FORTUITOUS indeed that a glimmer of sunshine from Washington in the form of a promise to increase copper allocations for the second quarter of 1952 brightened the picture as the panel of experts on automotive radiators began its deliberations before a capacity crowd at the SAE National Passenger Car Body and Materials Meeting in Detroit last month. The experts agreed unanimously that copper remains supreme as a material for radiators; that in the present state of the art there is no really satisfactory substitute. The panel appraised various substitutes and gave objective engineering reasons why they would not do.

CONSERVATION of copper and brass through design techniques was the theme of the presentation of J. H. Cooper of McCord Corp. Emphasizing the necessity for retaining copper and brass, he suggested a variety of avenues of attack by designers in the interest of reducing the weight of these critical materials. For example, it is feasible to redesign radiators so as to employ tanks and head sheets of thinner gages. Rounded or oval-shaped tanks can handle increased pressures with a major saving in weight. Cores can be designed for higher pressures to use less copper.

Surprisingly enough, some subtle changes in styling can exert a greater effect on weight saving and cooling system efficiency than anything the radiator designer can do. Design of bumpers and grilles, location of bumper guards and fog lamps, and venting of the hood, as well as the layout of the frontal area have a controlling effect on the cooling system. For example, only a four-deg drop in cooling system temperature incident to elimination of restrictions at the grille can save at least one lb of copper, with a saving of 44 cents per radiator.

The present trend to lower hoods and wider cores, in some instances results in loss of effectiveness of the fan, and contributes to bad idling conditions, leading to boiling in hot weather. In one instance, a specially formed bumper — of S-shaped cross-section — acted as a deflector, prevented air from entering the grille and lowered cooling efficiency by some ten per cent. A change in bumper form made it possible to eliminate two lb of copper in the radiator.

Wider spacing of bumper guards and fog lamps improved cooling by eight per cent in another case.

According to Cooper, improvement in radiator mounting to better cushion shock will make it possible to use a lighter core and thus further reduce weight.

The panel was unanimous in its agreement that substitute materials require a considerable period of road testing before any decision can be made as to their effectiveness.

Aluminum Radiators

One of the hottest topics currently, the prospect of using aluminum radiators in mass production, was tackled by J. R. Holmes, chief engineer, Harrison Radiator Div., General Motors Corp. They have been working with aluminum since WWII when a considerable volume of radiators and heat exchangers was produced for the Armed Forces. At Harrison, the automotive application of aluminum radiators is purely in the development stage. Use of aluminum poses many problems and has some decided drawbacks. But there are enough excellent features to justify the current development program.

SAE Engineers Copper Substitutes

On the plus side—the decided advantages—Holmes cites the following:

1. Reduction in weight of the assembly.
2. Relatively good heat transfer qualities.
3. Availability of aluminum.
4. Ability to handle high cooling system pressures.

This is one of the major advantages.

With the present state of the art, aluminum has some serious disadvantages. The following excerpts from the paper presented by Holmes give the picture quite adequately.

"We find that the cost of an aluminum radiator is considerably higher than that of copper, as the salt-bath is very expensive and each radiator drags out a considerable quantity of salt—at the current price, approximately \$2.00 for each radiator!"

"At the present time, we know of no solder compatible with coolant solutions which can be used on

aluminum; therefore, the joints must either be brazed or welded. This means subsequent operations to the making of the core and, at the present time, it must be hand-welded. This runs the labor cost very high.

"In all brazing operations there are voids in the process which must be repaired and these, at the present time, for the want of a solder, must be welded—if they are accessible. However, in the ordinary tube and fin radiator, or tube and center radiator, there are possibilities of voids which are not accessible to a welding-torch, or arc.

"Plastics have been suggested and tried, but they are an unknown quantity, as the process is very difficult and the life of the repaired spot is unknown.

"The thermal conductivity of aluminum is approximately one-half that of copper. This would imply considerable loss with aluminum over copper, but that is not too serious, depending entirely upon the gauge of the material which is used, as the resistance to heat transfer is in the film adjacent to the metal surface and not so much in the metal itself.

"Limitations as to type of radiator currently seem to be that tube and fin, and tube and center cores can be built readily; however, the close fit of the parts necessary with the available aluminum brazing sheets is of such degree that the tooling for the cellular type core is practically impossible in our current experience. We are, therefore, concentrating our effort on the two types previously mentioned.

"Supply of salt for the dipping process is limited

automatic dip machines, or fin and tube bake ovens, and replace them with salt-bath tanks.

"The wash equipment, after brazing, is about four times as elaborate as that necessary for the conventional radiator soldered with conventional fluxes.

"Since it takes in the neighborhood of four minutes, in our experience, to braze one of these units, you can see the number of pieces of equipment which would be necessary, as compared with the automatic solder dip machine, or bake ovens, which in our case is a matter of seconds from start to finish, instead of minutes. Since the brazing operation requires about ten times the weight of salt to that of the product, plus fixture, it will give you some idea of the floor space and terrific capital investment necessary to set up for high production of this type of unit."

Coated and substitute metals, the subject of considerable discussion recently, were given a thorough airing by Joseph Gurski, Ford Motor Co. His general summation is that copper and brass simply cannot be equalled by any substitute materials from the standpoint of adequate life, corrosion resistance, solderability, and cost. He ruled out of the picture such popular substitutes as steel without protective coatings; painted steel; coated steel prior to fabrication; and coating after soldering.

Copper-Clad Steel

Consideration is now being given to the use of copper-clad steel for the primary elements of radiators. This material, however, is decidedly limited by the quality and continuity of the coating since even minute defects will ruin the assembly. Besides the difficulty of controlling quality and lack of adequate means of inspection, clad steel involves a serious economic loss of copper or brass in the manufacturing process since the scrap is not recoverable. Moreover, scrap radiator cores would be a total loss since they cannot be salvaged except through costly refining procedures. Lead-alloy coatings are better on copper and brass than on steel for the reason that dip coats are porous and difficult to control.

Electroplated copper coatings on steel are not practical in mass production, according to Gurski, although acceptable for head sheets. Coating must be at least 0.003 in. thick and again there is the problem of continuity and perfection of the coating.

Fin surfaces must provide the equivalent of the characteristics of copper to assure reproducible results in production. At best, it is difficult to get equivalent cooling without a major increase in size. This is understandable in the case of steel since steel has only 16 per cent of the thermal conductivity of copper. Copper-clad steel for fins requires 10 per cent of thickness in copper on each side, and even then it has the drawback of rusting out at the cut edges.

Solid zinc fins have good corrosion resistance and good solderability. However, they require a protective dip or painted coating. On the other hand, since the supply is limited, its use is questionable under present conditions.

Finally, Gurski lists the following summary of the situation: (Turn to page 102, please)

Are Cool to in Radiators

to a single source at the moment, and the quantity available currently is not adequate to take care of Harrison production, let alone the rest of the radiator manufacturers.

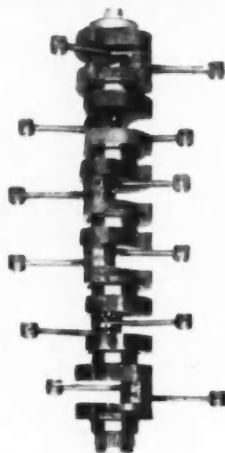
"Fixtures necessary to hold the many parts during the immersion in the salt are very important; therefore, they become somewhat elaborate and expensive. Thereby hangs another tale of woe—they last about 100 immersions in the bath and then have to be overhauled or completely replaced, as currently we have not found a satisfactory material which can stand the action of the salt-dip.

"I think I have given you the general picture on fabrication, material, heat transfer, and fabricating cost of the aluminum radiator. Now, I will deal with manufacturing facilities which, of course, would be a major change in anybody's plant, as conventional cellular radiator manufacturers would do away with their

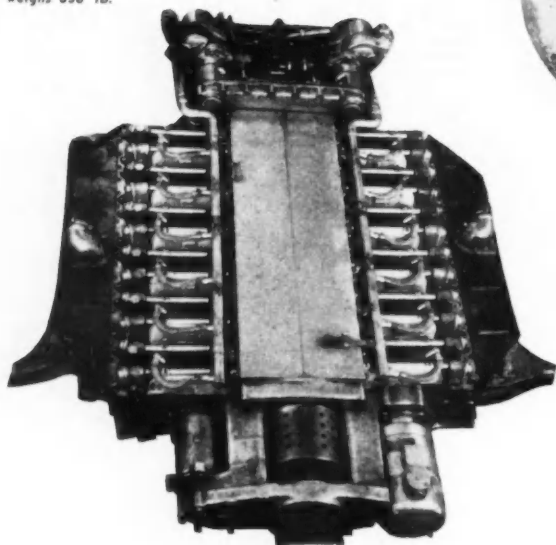
By W. F. Bradley

Special European Correspondent
for AUTOMOTIVE INDUSTRIES

The built-up crankshaft has seven ball bearings and is fitted with roller bearings for the connecting rods.



Panhard & Levassor 200-hp air-cooled engine. Complete with clutch it weighs 836 lb.



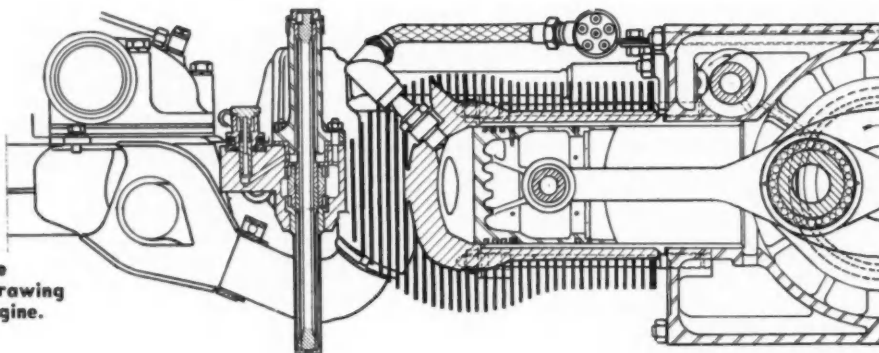
The transmission housing is built up of light alloy castings.

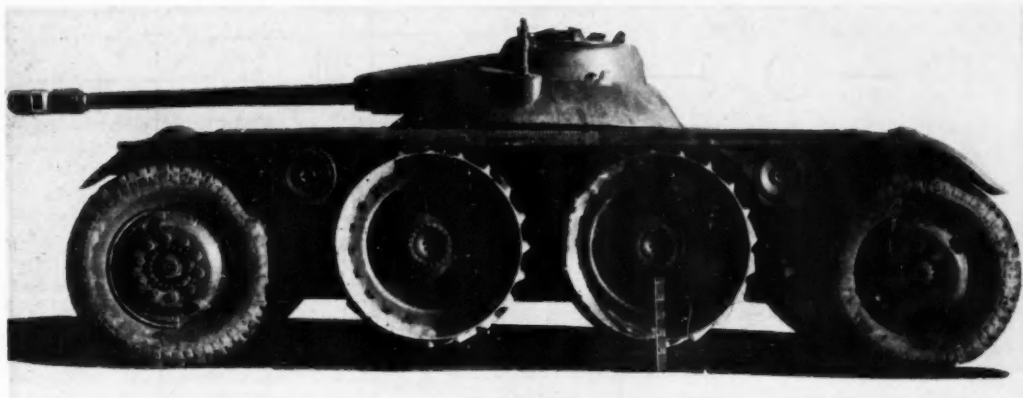


French

THE Panhard & Levassor Co., of PARIS, FRANCE, has gone into production of a scout car, or armored vehicle, designed to meet the requirements of the Armament Division of the French War Department. The specifications called for a machine capable of high speeds on the highway, combined with the ability to negotiate practically all kinds of cross-country conditions. The speed requirement ruled out the creeper track, so the engineers decided on an

Transverse
Sectional Drawing
of the Engine.





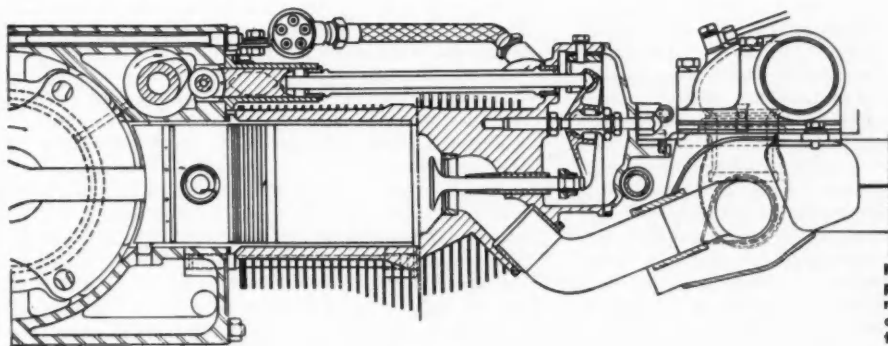
The new French armored car has a top speed of more than 60 mph, and can be steered from either end.

Armored Vehicle Has Eight Driving Wheels

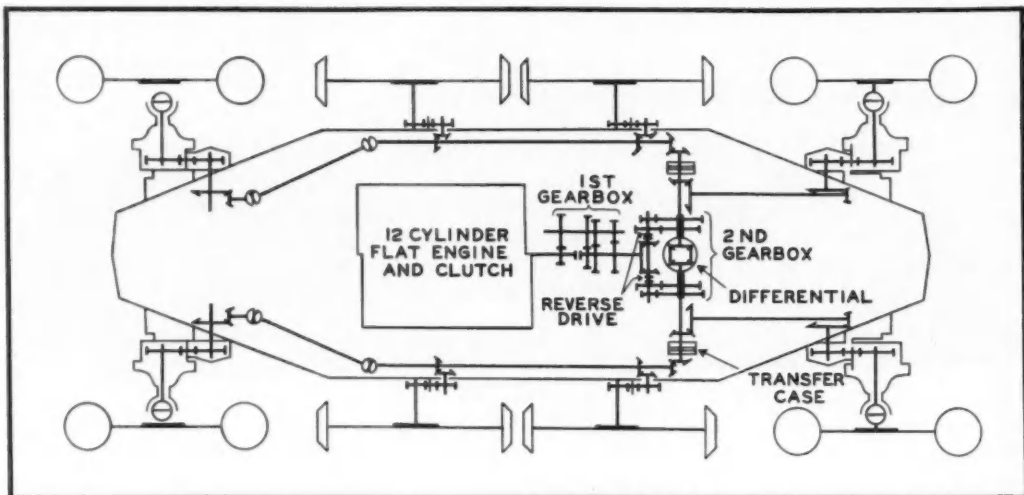
eight-wheeler, the front and rear pairs being equipped with pneumatic tires, and the four center wheels being of the agricultural tractor type, with a device for raising or lowering them, as desired. All eight wheels are positively driven, but the center pairs do not make contact when running on hard roads. This layout provides a vehicle capable of better than 60 mph on the highway, with a cross country ability almost equal to that of the creeper-track tank. Other military requirements which had their influence on the design were low unsprung weight, reduced area, and rapid and easy manipulation.

An outstanding feature of this design is the use of an aircooled opposed flat twelve engine which, while built specially for this military machine, is based essentially on the aircooled flat twin used on the Panhard & Levassor passenger car and will, later, be produced with four, six, and eight cylinders for civilian use.

The twelve-cylinder engine is an under-floor type centrally mounted in the chassis, where it has the maximum protection. To reduce the vulnerability of the vehicle, a maximum height was given by the War Department, together with a minimum road clearance. It was possible to keep to within an inch of the rec-



Note that the one piece connecting rods of opposite cylinders are attached to the same crank pin.



Schematic illustration showing arrangement of units in the vehicle.

ommendations by holding the height of the engine down to the low figure of 8.6 in. Its width and length are 35.8 in. by 61 in.

The cylinders have a bore and stroke of 3.14 by 3.93 in. and are separate light-alloy castings with integral head and nitrided iron liners. They are mounted on a longitudinally-split, light-alloy crankcase by means of long studs passing into lugs near the top of the cylinder. The projecting barrels recess into the crankcase. The two nitrided valves per cylinder, located in the head, are of different size, and have bronze seats for the inlets and steel seats for the exhausts. Operation of the camshafts is by herringbone gears. The roller type tappets are light alloy.

Valve operation closely follows Panhard & Levassor passenger car practice, each cylinder having on its head two integrally-cast rocker arm boxes, with a removable cover plate for the pair. Valve clearance is obtained by raising or lowering the entire rocker, which has a spherical seat, instead of the usual method of using an adjustable screw on the end of the rocker. Valve springs are enclosed torsion bars set across the head, between the two rocker boxes, as on the passenger car engine. This patented Panhard system has been in use for several years on the passenger car.

Another Panhard feature is the use of roller bearings for mounting the connecting rods on the shaft. This device consists of large diameter load-carrying rollers alternating with smaller diameter spacer rollers in cages. The bronze-bushed piston pins are fully floating. The crankshaft, which is of the built-up type carried in seven ball bearings, is assembled by shrinkage, one part being moderately heated, and the other shrunk by liquid nitrogen. Assembly takes place in a press. The engine has no flywheel, but mass is obtained by means of counterweights on the crankshaft. The two banks of cylinders are slightly offset to allow of side-by-side mounting of the rods. Complete weight

of the crankshaft, with the twelve rods, is 154 lb. Light-alloy pistons with deeply ribbed heads are used and these carry three compression and two oil rings. With ball and roller bearings, lubrication is simplified, but the dry sump system has been used primarily to hold down total engine height. The oil pumps are grouped at the front end of the engine, and comprise one feed pump for the main bearings, with a drip feed from these to the connecting rod bearings, and a second pump for the overhead valve gear. The two inclined magnetos are to left and right of the oil pumps, and are completely shielded to prevent radio interference. The wiring harness passes through a tube along the base of each bank of cylinders, with individual leads up to the plugs inclined in the head. This layout gives access to the entire engine by removing trap doors in the floor of the turret housing.

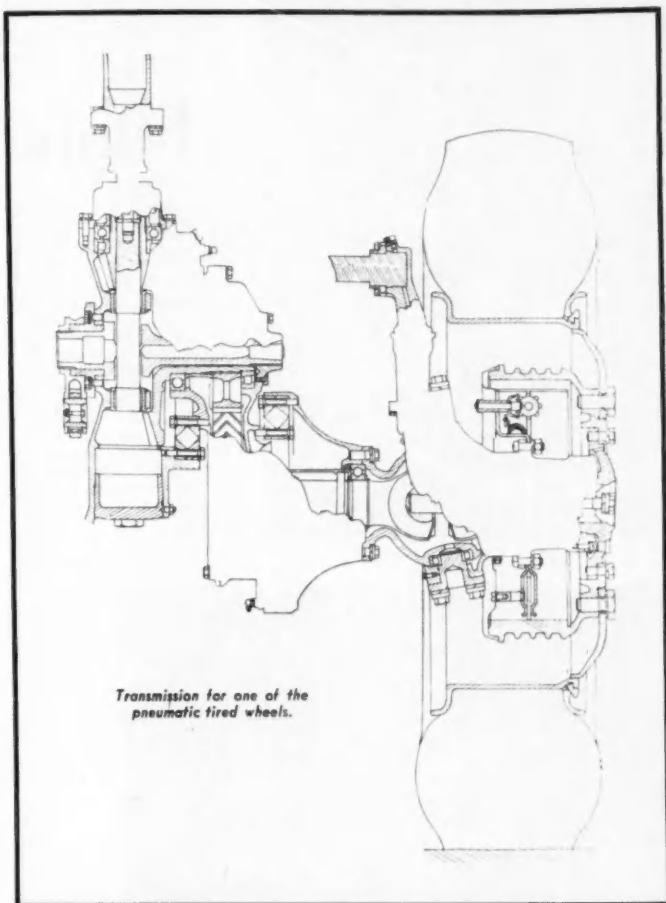
The manifolding is laid out with the exhaust on the lower side and the intake on the upper side. The carburetors, one for each bank of cylinders, are not mounted directly on the engine, but on the sides of the cockpit, where they are connected to the wall-type air filters and to the manifold by flexible connections. The main air intake is around the base of the gun turret, and the exhausts are led up to the same height, flush with the top of the platform, or 50 in. above the ground.

Cooling is of a special nature. There are two suction turbines—one for each bank of cylinder—the vertical shafts of which are driven by bevel gearing from one end of the engine and are geared up in relation to the engine. Air admitted around the base of the gun turret is drawn downwards, over the cylinder barrels, which are ducted to give an even flow over the entire surface, into the underpan and by suction to the discharge pipes at the base of the turret. Assuming that the watertight doors are closed, the vehicle can go through water to the top of the wheels, for inlet and exhaust are several inches above this, on the face of the plat-

form. Complete with its clutch, the engine weighs 836 lb, bare weight being only 550 lb. Effective output at the shaft—deduction being made of the power absorbed by the blowers—is 200 hp from 3800 rpm up to 4000 rpm. The specific power output is held lower than for the passenger car engines, to assure a greater margin of safety for continuous operation under full load.

A four-plate clutch is used, each plate being individually ventilated. The generator and the electric starting motor are respectively to left and right of the clutch housing. The transmission housing is built up of seven light alloy casting assembled by bolts and having three-point attachment to the frame, with the nose of the transmission housing sleeved into the clutch housing on a rubber ring, giving a slight relative movement between the two. The transmission consists of two four-speed gearboxes, one after the other; this gives a total of 16 combinations. Two shafts carry the drive forward to the front steerers, and two other shafts carry it rearwards to the central set of four wheels as well as to the two rear wheels. All wheels are independently sprung, the four outer ones being on trailer arms and having double coil springs.

Because of the fact that the four central wheels have to be raised for high-speed work on the highway, their suspension is special, consisting of a hydro-pneumatic cylinder for each wheel, mounted inside the vehicle, and used either as a jack to raise the wheel off the ground, or as a suspension unit when it is in contact with the road. Each suspension unit is said to weigh only 26 lb. A feature of the central wheels is that they are composed of a steel-disk hub and a separate rim carrying spuds. The attachment of hub to rim is through a series of rubber blocks 1½ in. thick. The four outer wheels are bolted-on steel disk type, fitted with Michelin metallic carcass F-24 casings having a section of 11½ in. and a diameter of 48 in. These have a special puncture-proof tube, the V.P. Hutchinson, composed of a multitude of cells filled with nitrogen under pressure. This type of tire

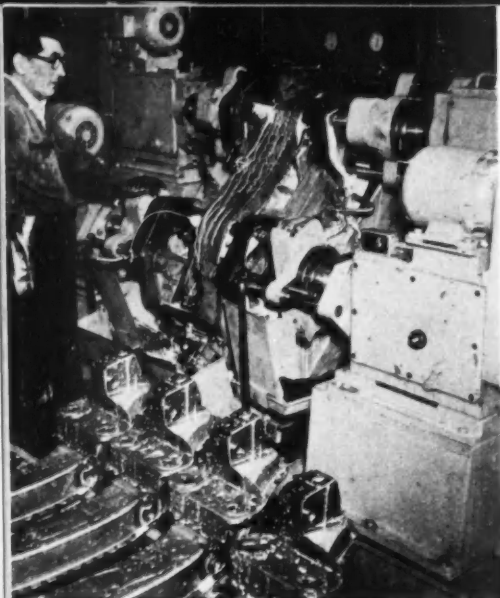


Transmission for one of the pneumatic tired wheels.

necessitates the use of a straight-side or split rim, and has been adopted by the French military authorities for a large number of fighting vehicles, including tanks.

Steering is by hydraulically-assisted rack and pinion. There are two steering columns and two sets of controls, making it possible to drive from either end. Naturally one set of steering wheels is locked, but can be released to allow of front and rear steering.

The separate generating set consists of a Bendix six kw generator and a single cylinder engine of the same general type as that of the main engine. Used primarily for radio, it has a clutch connection through which it can be used for direct starting of the main engine, or for driving the vehicle at very low speeds. Complete with its gun and armor plating, this vehicle weighs about 13 tons.



1 Archdale special two-way combination drilling and reaming machine for the front axle beam welding assembly. It produces the holes into which the fulcrum shafts are screwed. Clamping is air-operated. Floor to floor time is less than one minute.

High Production

in Plant

Vauxhall

DURING the summer months last year Vauxhall Motors, Ltd., the General Motors operation at Luton Beds, England, did extensive retooling for its 1952 model (see *AUTOMOTIVE INDUSTRIES*, August 15, 1951). Since then the production of the new car has proceeded as planned and the new tooling is now in full operation.

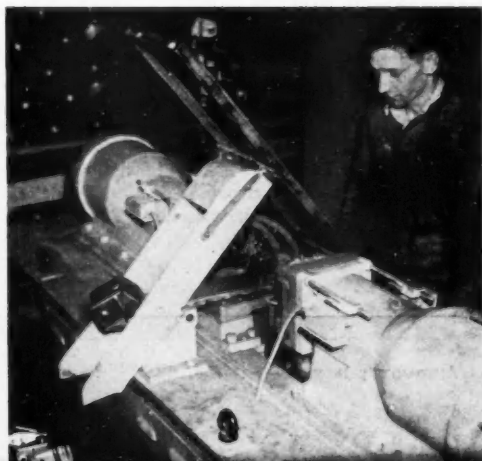
Reproduced here are illustrations of some of the highlights in the fabrication of the large front cross member, as well as the multi-spot welding of large body elements. The Presswelder, combining a large Clearing press and Federal welding equipment, is designed for welding large elements such as the



2 Built and designed by Vauxhall, this special machine is arranged to drive fulcrum shafts into the previously drilled and reamed holes, the shafts cutting their own thread in the process. Four shafts are assembled in approximately 1.5 minutes floor to floor time.

3 Bosses are brazed to the front cross member in these 7-kw induction heating machines at the rate of one minute floor to floor time.

4 Bosses are welded onto both sides of shock absorber housings at the rate of 300 an hour in this 600-kw, horizontal, twin-head Metro-Vickers special purpose projection welder. In the center is the automatic unloader, seen in the act of ejecting a finished part.



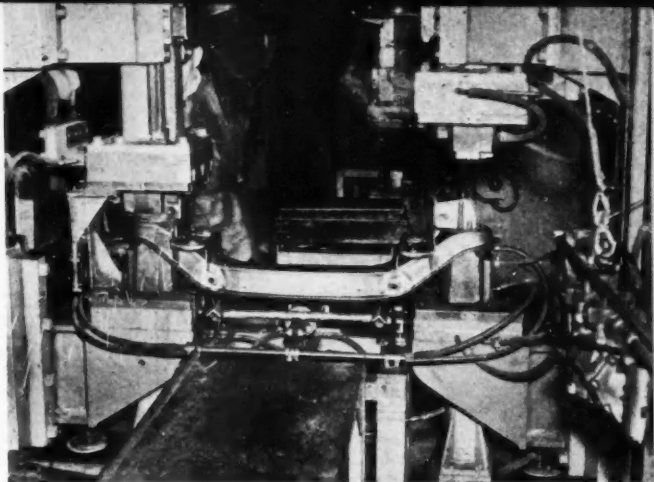
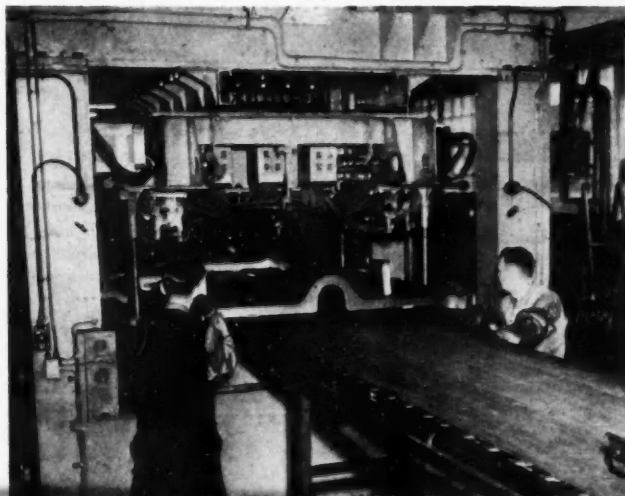
Machines of Motors

front underbody section, the underbody assembly, doors, and trunk lids.

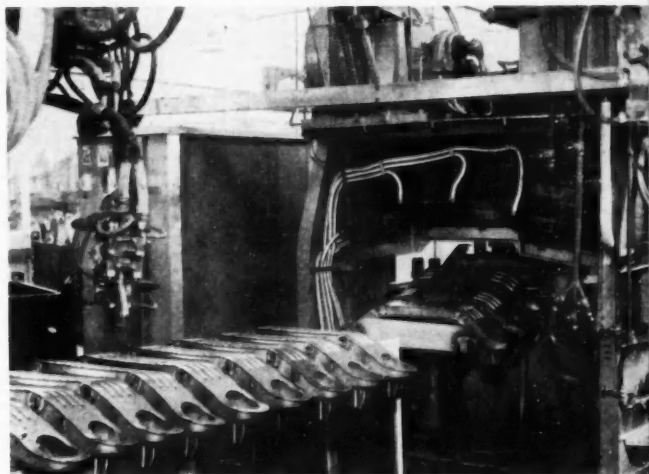
These selected operations reveal some of the advanced methods and items of special equipment that should go far to lift productivity and quality. Attention is drawn particularly to the utilization of completely automatic cycles as well as advanced materials handling practice, including automatic loading and unloading.

One of the big multiple-spot welding machines found here is the Presswelder made by the British Clearing Co. It is fitted with hydraulic controls. The electric control and accessories were provided by the British Federal Welder Co. This view shows the loading of the front floor section into the five-ton fixture designed and built by Vauxhall. This operation produces 64 welds simultaneously, productivity being around 300 assemblies an hour. An interesting feature of this operation is the provision of the belt conveyor for transporting work to the loading station and out of the machine.

5



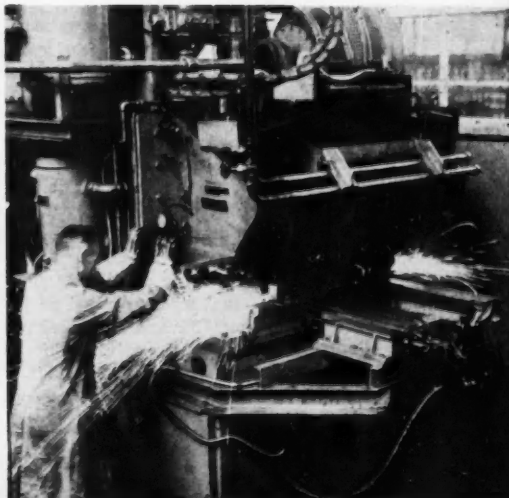
Two Metro-Vickers 750-kw projection welding machines mounted in tandem 8
weld shock absorber housings to the front cross member.



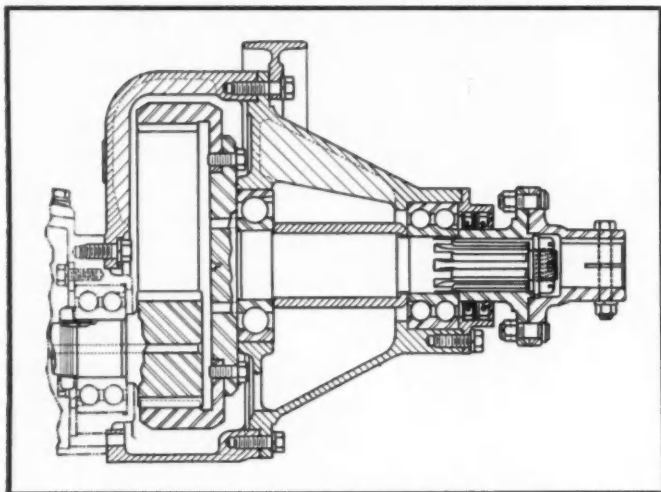
This is a rear view of the Sciaky welding machine, showing the slide rails 7
on which the work leaves the machine.

Sciaky provided this resistance welder for joining cover plates to the front cross member assembly. These massive welds are handled at the rate of 300 assemblies per hour.

6



Precise Machining



This sectional drawing shows a typical reduction gear. The drive gear is standardized, and a suitable ring gear is used for each ratio.

Produces

Quiet

Gears

By E. C. Freeman

Supt. of Mfg.
Marine and Industrial Engine Div.
Chrysler Corp.

QUIETNESS, freedom from vibration, and durability are major requirements of gearing for marine engine applications. This applies particularly to the reduction gear set, although at Chrysler the timing gear train demands the same meticulous care to assure freedom from noise in the powerplant assembly.

As shown in the sectional view, the reduction gear assembly consists essentially of a large drive pinion which is integral with the drive shaft; and a large diameter internal ring gear. These gears are of helical type. Because of the variety of gear ratios demanded by marine engineers, the internal type of gear set lends itself admirably to these requirements, the best answer being found in standardizing upon one drive gear, and by supplying suitable ring gears for each ratio.

It may be mentioned at this point that the perfection of mating gears, durability, and the elimination of noise are the results of precise quality control coupled with the technique of rotary cutter gear shaving, using the familiar National Broach Red Ring equipment adopted by this division many years ago. However, in addition to the usual gear shaving procedure—on the internal ring gear and on the timing gears—the Red Ring Elliptoid crown shaving technique is used in finishing the drive pinion as well as the camshaft gear in the timing train. This procedure

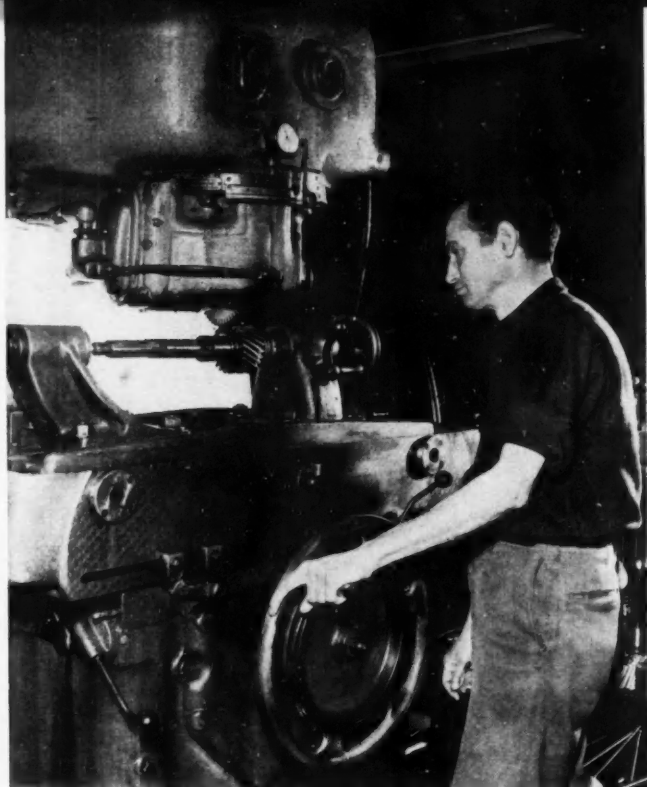
combines to eliminate noise as well as edge loading due to the deflection of shafts and other causes for misalignment under severe operating conditions. This, in turn, is responsible for an enormous improvement in durability and makes possible the use of smaller gear sets.

The range of gear ratios made available, together with the center distance of input and output shafts in each case, are shown in the following tabulation. It may be noted that Chrysler has made it a practice to avoid even ratios in the interest of further reducing noise level.

Ratio	Center Distance (in.)
1.434 to 1	23/32
2.043 to 1	1 23/32
2.565 to 1	2 9/16
3.17 to 1	3 9/16
3.956 to 1	4 27/32

Turning to the design data and fabrication of the gear set, the drive pinion is of helical type with a face width of two-in. and OD of 3.545-3.550 in. Gear cutting is done in two separate operations—rough hobbing in Barber-Colman hobbing machines; Elliptoid crown-shaving in the Red Ring gear finisher. Because of the generous face width the crown shaving operation reduces the tooth thickness by 0.001 in. at each end.

It is of interest that the entire pinion shaft is hard-



Close-up of work station of Red Ring gear finisher set up for crown-shaving reduction drive pinions. The machine guard has been removed to show this detail.

ened and drawn to a Brinell hardness of 250 before hobbing and crown shaving. Following crown shaving the gear teeth are flame-hardened in a Fellows flame-hardening machine. Gear teeth are flame-hardened to a depth of 0.060-0.080 in. measured at the pitch line. The work is quenched in oil and drawn at about 350 F. Final hardness of gear teeth is approximately 55-58 R_c. Condensed data on the pinion are given below:

No. teeth	23
DP	7
NP	7.7278 in.
Diametral PA	20 deg
PD	3.2857 in.
Full depth	0.308 in.
Addendum	0.132 in.
Helix angle	25 deg, 4 min
Spiral	RH
Lead	22.0695 in.

Production test stand for inspection of reverse and reduction gear assemblies. These units are operated under a schedule simulating service conditions.

Backlash with mating gear is held to 0.004-0.006 in., provision for adjusting backlash being made in the housing by virtue of an eccentric pilot.

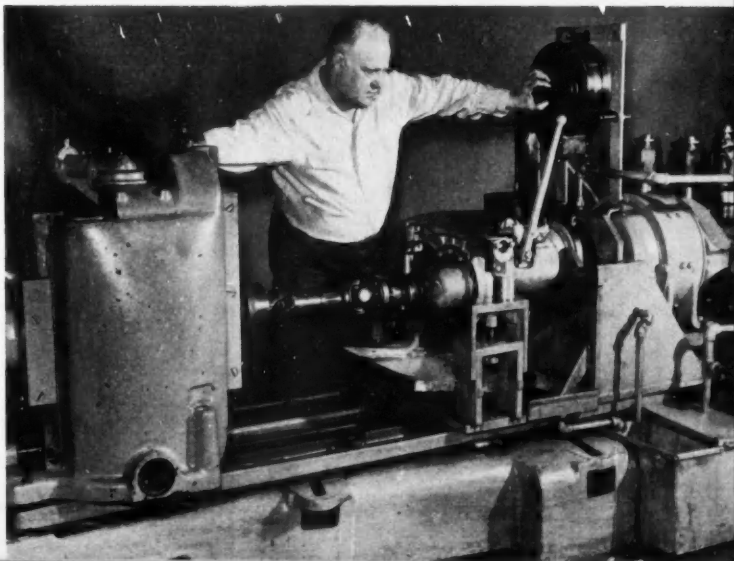
The mating internal ring gear, on the other hand, is machined from a steel forging, the forging being heat treated before machining. Internal gear teeth are cut on Fellows gear shapers, then shaved in another Red Ring gear finisher tooled for the purpose. Gear data for a typical ring gear—2.565 to 1 ratio—are listed below:

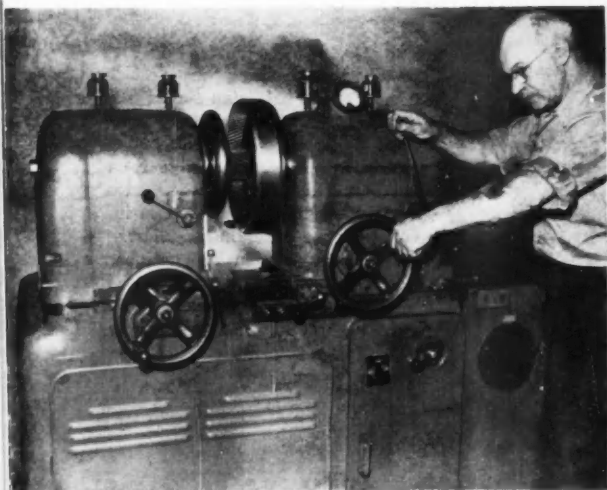
No. teeth	59
DP	7
Diametral PA	20 deg
PD	8.4286 in.
Full depth	0.232 in.
Addendum	0.062 in.
Helix angle (RH)	25 deg, 4 min

In initial machining the inside diameter is held to 8.303-8.307 in. The center bore, for piloting, is held to 5.813-5.814 in. after finish grinding, and is held square with the axis to assure alignment at assembly.

Naturally the production of gear sets as well as reduction gear assemblies is done on a job-lot basis, using the same equipment for the various parts.

Since quality control is of major importance, this division has in operation a modern gear laboratory fitted with inspection equipment of latest type. Among other equipment there is an Illinois gear checker of chart recording type, used for checking the first gear of each new setup on gear shavers and for each time





Red Ring gear speeders are employed for 100 per cent inspection of mating reduction gears to assure quietness at operating speeds.

View in gear laboratory. This shows the Illinois involute checker with the chart recorder cabinet at the left.



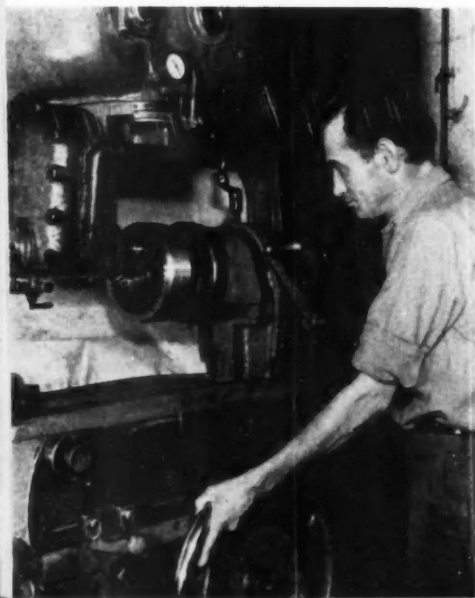
a new Red Ring cutter is placed in operation. This assures accuracy of the setup since it is held to a limit of 0.0002 in. on the involute.

Besides the control of gear cutting, quietness of gear sets is subject to three independent 100 per cent inspection procedures. First of all, mating gears are run in Red Ring gear speeders to check for noise before acceptance for assembly. After assembly, the reverse gear and reduction gear units are assembled together and the resulting assembly is put through

a standard test procedure to check on operating characteristics as well as quietness.

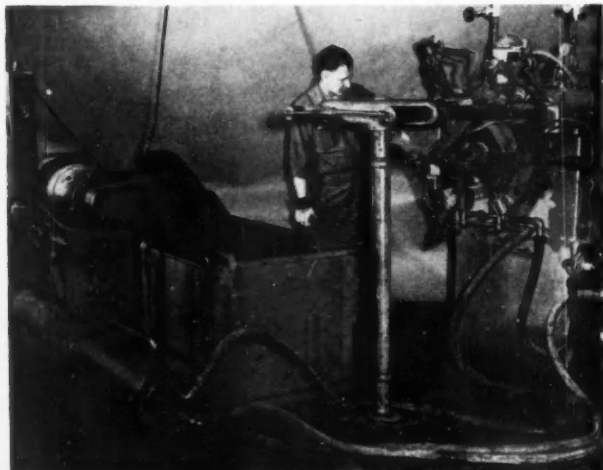
Finally, there is a third test in which the entire powerplant assembly—engine, reverse gear, and reduction gear—is run through a test schedule on the dynamometer. The final test usually takes about two hours and is designed to produce a finely tuned powerplant ready for installation in a hull and capable of operation by the owner without further tuning.

(Turn to page 82, please)



Red Ring gear finisher with guards removed to show shaving of the internal ring gear.

Drive gear teeth are flame hardened to a depth of 0.060-0.080 in. in this Fellows machine.



Russia's Jet Warplanes

By Ian Morton

A. V. Roe Canada, Ltd.

SINCE the end of World War II, the USSR has been particularly careful not to give away details of airplanes and engines used by her fighting forces. However, captured newsreels from Korea, photographs taken by correspondents in Germany, and descriptions and sketches by Allied pilots have enabled astute Western observers to form a fair idea of Stalin's air strength—or weakness.

Russia's jet history started in the spring of 1945, when an aircraft known as the MiG-7 flew for the first time. This experimental machine was a "lash-up" in the true sense of the phrase, consisting simply of a standard piston-engined MiG-3 airframe, sans engine, "married" to a modified German Jumo 004 turbojet, and faired in. Data obtained from this experiment enabled Soviet technicians to make a speedy start on the design of the MiG-9, a twin-engined jet fighter of similar aerodynamic form, which entered service later in 1945.

It was about this time that Russia received unexpected aid from Great Britain in the shape of a consignment of 55 jet engines and spares. During 1947 and early 1948, 30 Rolls-Royce Derwent 5's and 25 Nene 1's were delivered into eager Soviet hands. Much to the annoyance of the United States, the British government even invited Soviet technicians to undergo a course in jet maintenance at the Rolls-Royce plant in Derby.

From then on, steady progress was made. Under the direction of designer N.B. Chelomy, the power output of the Nene was progressively stepped up from 4500 lb static thrust to its 1951 rating of 5500 lb. High-speed fighters, such as the MiG-15 and La-17, are powered by M-45 units, as they are designated, and operations in Korea suggest that these Russian turbojets are extremely efficient under combat conditions. Reliable reports indicate that the M-45 is now being modified to obtain 6000-6500 lb static thrust, and new versions will be in production very soon.

During the period when the centrifugal-type Rolls-Royce engines were being delivered, Russia had already been working for three years to design and produce German axial-flow units using the captured BMW 003A-2 and the Jumo 004B-4 as a basis for developments. Redesignated M-003E and M-004H, they had their power output increased from 1760 lb and 1980 lb thrust, to 3750 lb and 4000 lb respectively. Early Red aircraft powered by these turbojets provided Stalin's air force with a much-needed morale booster at a period when other nations were forging ahead with jet propulsion. Present production is now concentrated

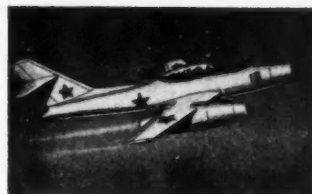
on the M-012 (6600 lb thrust), and the M-018 (8000 lb thrust), two of the most powerful turbojets in the world.



IL-24



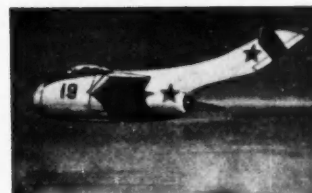
YAK-21



LA-15



MIG-15



MIG-19

In the field of rocket power-plants, Russian designers have made further use of German data by producing a development of the Walter HWK 509C liquid-fuel rocket (rated at 4400 lb static thrust in 1945) which powered the Junkers Ju-8-248, an improved version of the Messerschmitt Me-163 tailless fighter of World War II. With an aggregate thrust of something like 6600 lb, the Soviet "rocketjet" has been under test for some time in the Yak-21, a diminutive experimental interceptor-fighter of obvious German parentage.

Soviet designers would appear to be giving the highest priority to thrust augmentation for their current production turbojets. For a time, long after-burners were not favored by the USSR, but several high-speed swept-wing jets seen at the annual Moscow air display at Tushino airport in July of last year, would indicate a complete reversal of policy.

Liquid-fuel rocket assisters have not been neglected, and future Soviet developments of the 2500 lb thrust German BMW 718 should compare favorably with the new British Armstrong Siddeley Snarler and other Allied units.

Thus it can be seen, that Russia's present policy is to concentrate on three main types of turbojet, namely the M-45, the M-012, and the M-018, together with various forms of augmentation to increase available power output.

It is reassuring, however, to remember that the downfall of Germany's Luftwaffe came from over-standardization of equipment.

Production Jets of the Red Air Force

MIG-9—1945

Designed jointly by Artem I. Miloyan and Mikhail I. Gurevich, the MiG-9 was a direct development of the early MiG-7, and had the honor of being the first series-production jet aircraft to go into service with Soviet Air Force. Its meager performance with two M-003 axial turbojets of about 2000 lb static thrust each soon resulted in production being tapered off in favor of the single-engined Yak-15 fighter. MiG-9's, however, are still in service in small numbers with the East German and other satellite air forces.

YAK-15—1945

Similar in layout to the MiG-9, the Yak-15 is another early piston aircraft rework of about the same period. The 4000 lb thrust M-004H axial turbojet exhausted under the fuselage causing the loss of many tailwheels in early

(Turn to page 76 please)

News of the MACHINERY INDUSTRIES

By Thomas Mac New

Increasing Shortage of Skilled and Semi-Skilled Workers. Machine Tool Shipments on the Upswing as Orders Continue at High Rate.

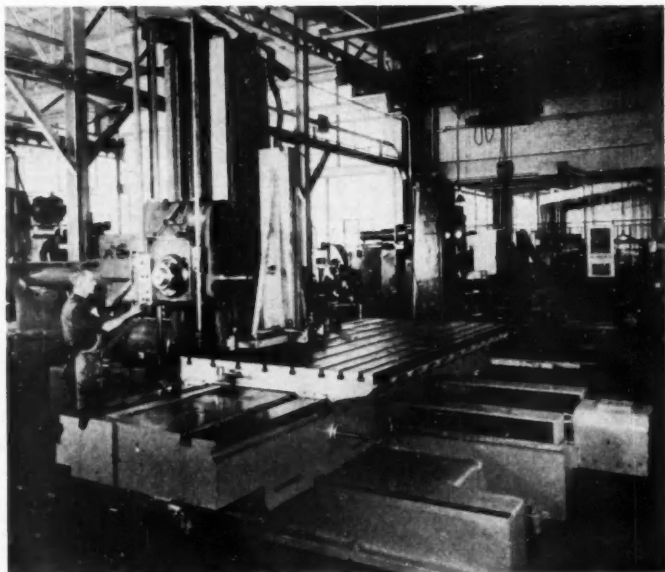
Tool Builder Looks Ahead

According to Ralph E. Cross, executive vice-president of the Cross Co., the machine tool industry is currently taking all possible steps to make up for lost time, but more trouble lies ahead in a different direction. He states that unless something is done about it now, we are not going to have trained manpower to operate the many new machine tools in the many new plants which are being built to increase our Nation's productivity capacity. This is true despite the fact that there are some 120,000 unemployed in Detroit, because most of the jobless are unskilled workers. The coming shortage will exist in the semi-skilled and skilled trades, according to Mr. Cross.

His conclusion in respect to the situation is that production will break down unless steps are taken now to train men for the required tasks. "Raising the level of education of our unskilled workers," Mr. Cross says, "is a must if we are to man and efficiently produce with the new productive facilities that we are building today." He believes that action in this direction will serve a two-fold purpose—it will reduce unemployment and expedite the defense program.

Automatic Operation

No doubt, because of the current shortage of skilled employees to operate machine tools and other productive equipment, the Harvard report on automatic machine operation without human direction will be of extreme interest to many tool builders as well as the manufacturing plants of the automotive industries. The report, which will be released shortly, will be an analysis of all of the automatic machine controls that have been invented to date. Research on this project has been done by a group of Harvard Business School graduate students.



This huge horizontal table-type Lucas boring mill has been placed in operation in the Ann Arbor Plant of the Buhr Machine Co.

Boring Mill for Machine Tool Plant

One of the largest boring mills in the midwest has just been put to work in the Buhr Machine Tool Company's Ann Arbor Plant. Joseph H. Buhr, president of the firm, announced that the huge boring mill, a horizontal table-type Lucas, is equipped with automatic power positioning, and has a vertical travel of 84-in. and a cross travel of 134-in. This machine will enable the plant to do its own machining and boring of main bases and large castings.

Indices

The American Gear Manufacturers Association index for last December was 716.5 per cent of the 1935 to 1939 base period. For the year 1951, the average index was 695.7 which is 238.5 index numbers above 1950.

Machine tool shipments are still on the upswing, according to reports issued by the National Machine Tool Builders Association. January shipment index stands at 266.3 per cent of the base period—1945 through 1947. The unfilled order ratio to demonstrated production rate is 18.1 to 1. This is the lowest since February 1951. New orders for January have shown a slight increase over December—381.0 to 376.5. Foreign orders were doubled in January with an index of 35.5—December stood at 18.3.

Plant Safety Encouraged

General Motors Corp. is distributing to its machine tool builders a rather interesting booklet on safety interpretations of the Joint Industry Conference electrical standards for machine tools. (Turn to page 84, please)

NEW EQUIPMENT

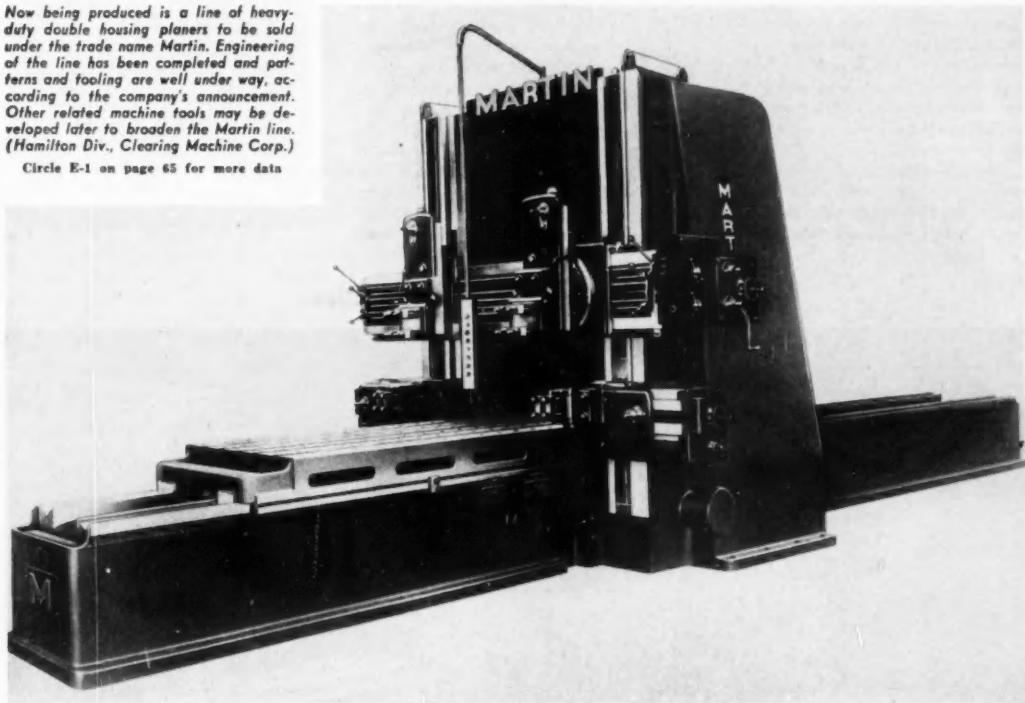
PLANT • PRODUCTION

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 65

Heavy-Duty Double Housing Planers

Now being produced is a line of heavy-duty double housing planers to be sold under the trade name Martin. Engineering of the line has been completed and patterns and tooling are well under way, according to the company's announcement. Other related machine tools may be developed later to broaden the Martin line. (Hamilton Div., Clearing Machine Corp.)

Circle E-1 on page 65 for more data



Gouging and Chamfering Electrode

A specially formulated electrode designed for gouging, chamfering, cleaning, and partial milling operations on any metal or alloy has been recently announced. The product, ChamferTrode, it is claimed, speeds up fabricating of armor plate and similar difficult-to-cut alloys. Added features include the use of the electrode as a short cut to faster machining operations since it is said to easily remove unwanted metal.

The newly developed ChamferTrode features a heavy coating which

forms a cone at the striking end of the electrode, providing a natural jet effect arc. Surface of the gouged or chamfered material that has been acted upon by ChamferTrode is said to be free from oxidation and slag, thereby providing a clean surface for later brazing or welding operations which may be desired.

The chamfering blast is so concentrated that warping on thin material is negligible and in all cases the physical properties of the base material are claimed to be unaffected.

In addition, the heavy coating is said to be specially designed so that arc establishment is momentarily delayed, thus enabling the operator to pre-place the electrode exactly at the precise point at which he wishes metal to be removed before lowering his shield or protective glasses to proceed with the work. Regular DC welding machines are used as the power source. *Eutectic Welding Alloys.*

Circle E-2 on page 65 for more data

(Turn to page 56, please)

NEW**EQUIPMENT****PLANT • PRODUCTION***For additional information, please use postage-free reply card on page 65**(Continued from page 55)***Table Model Fatigue Testing Machine**

A redesigned model of the Baldwin-Sonntag SF-2 fatigue machines has recently been announced. The SF-2 is a table model, the smallest of five standard models which now range in alternating force capacity from 25 to 10,000 lb or from 50 to 20,000 lb in one direction only. Maximum travel of the loading yoke is $\frac{1}{2}$ in. and testing speed is 1800 cpm.

Maximum load capacity was increased 25 per cent and redesign makes the machine similar to the next larger size fatigue machine, the SF-

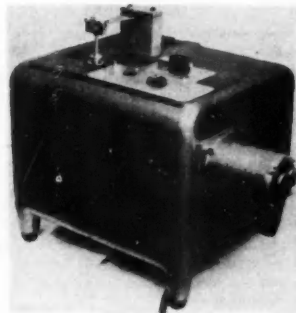
01-U. Simulated service tests of small parts can now be made on the machine whereas the original machine was limited to sheet metal specimens.

Another feature is an accessory preload attachment which becomes a part of the machine when desired.

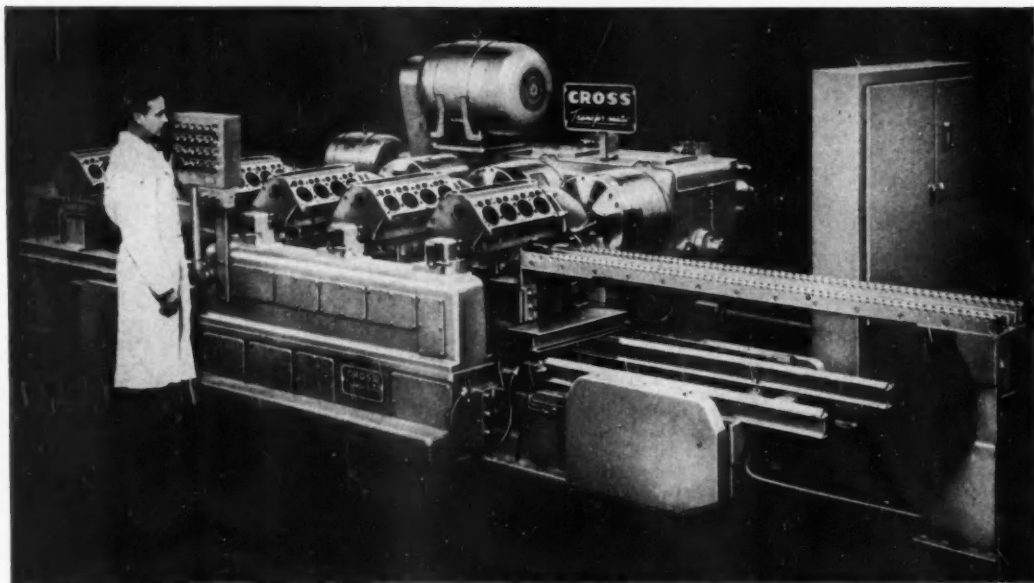
SF-2 is driven by a $\frac{1}{4}$ -hp synchronous motor, has a dial load indicator which is graduated in 0.125-lb increments, and a cycle counter. The new design provides a cage guided by flexure plates which absorb horizontal components of centrifugal force, and

a tension-compression spring for inertia force compensation. Within the cage is an eccentrically mounted mass driven by the motor through flexible couplings. The mass is on the end of a micrometer screw by means of which the dynamic load is varied. A scale on the cage indicates the centrifugal force produced by the revolving mass. Baldwin-Lima Hamilton Corp.

Circle E-3 on page 65 for more data



Baldwin-Sonntag fatigue machine, Model SF-2.

Transfer Machine Engine Assemblies

A Transfer-matic for boring and facing flywheel housings and cylinder block assemblies has been recently delivered to a leading car manufacturer. On this particular transfer machine, the work travels from an incoming conveyor to the machining station and from there to an outgoing conveyor. The machine is able to produce 81 pieces per hour at 100 per cent efficiency. It bores the transmission hole and faces the transmission face concentric and square with the crankshaft bore.

Downtime is greatly minimized by the use of pre-set tools which facilitate changing operations. Many automatic features are incorporated in the new Transfer-matic including automatic lubricating, automatic power operated located and clamping and automatic balancing mechanisms for cross-facing slides. Other features include individual hydraulic feeds for boring and facing, construction to J.I.C. standards with standard wire, and hardened and ground ways. (Cross Co.)

Circle E-4 on page 65 for more data

Paint Booth Conditioner

PB-1, a conditioning agent for industrial paint spray booths, has been developed and is now available. The product is used in the water circulating system and is designed to prevent adhesion of paint to the curtain wall and to assist the water cascade in preventing escape of paint into the atmosphere.

Pennsalt PB-1 is a highly alkaline, anhydrous, free-flowing, dust-free material containing non-foaming agents. It is packaged in 400-lb drums. *Pennsylvania Salt Mfg. Co.*

Circle E-5 on page 65 for more data.

Brazing Flux For Titanium

For use in the joining of titanium and zirconium, and their alloys, a special brazing flux has been developed. Silver brazing alloys readily wet the titanium which is protected by the flux.

Tensile strengths of 45,000 to 50,000 psi are obtained with butt joints in commercially pure titanium, according to the company. Lap joint test specimens may break outside the joint if the lap is more than three times the thickness. Heating may be done with either oxyacetylene torch or furnace; ordinary brazing technique is used.

It is called Special Handy Flux for Titanium. *Handy & Harman.*

Circle E-6 on page 65 for more data.

Spirits Washer

A mineral spirits washer designed especially for one-man operation has been placed on the market. The loading and unloading of the machine has been made a one-station operation by the use of a return-type conveyor.

Cleaning cycle of this equipment consists of two washing stages and a forced air blow-off. Adjustable spray nozzles are said to provide an even,



Detrex mineral spirits washer.

AUTOMOTIVE INDUSTRIES, April 1, 1952



Knuckle-Joint Press

The largest knuckle joint press ever built, according to the maker, has been recently shipped. The press has a capacity of 4000 tons, stands 34 ft and weighs 305 tons. Bed area is 60 in. by 70 in.; die space is 40 in. It will be used for coining and extruding operations. Bliss equipped it with a six-station ratchet dial feed, 59-in. diam, with electrical protection for indexing. A 200 hp motor drives the press at 12 strokes per min through double gearing. Slide adjustment of one in. is marked with micrometer indication and can be locked in positive position. *E. W. Bliss Co.*

Circle E-8 on page 65 for more data.

all-over coverage of the parts being cleaned, regardless of irregularities in shape. A series of safety devices, incorporated in this machine, include: Explosion proof switches and motors, all moving parts manufactured of

non-ferrous metal, a complete exhaust system and an automatically actuated carbon dioxide system. *Detrex Corp.*

Circle E-7 on page 65 for more data.

(Turn to page 58, please)

NEW

EQUIPMENT

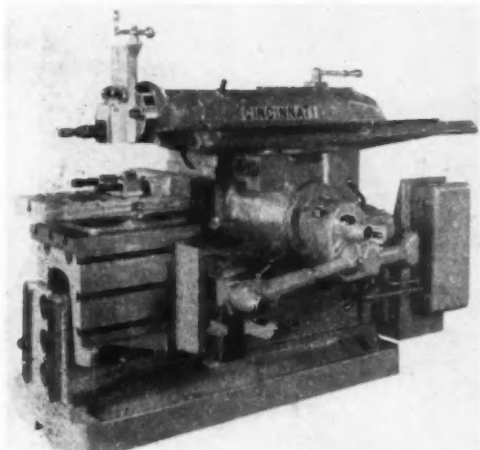
PLANT • PRODUCTION



For additional information, please use postage-free reply card on page 65

(Continued from page 57)

Magnetic Clutch Equipped Shaper



Electro-magnetic clutches and brakes are now standard equipment on Cincinnati shapers. The new clutch and brake is said to insure instant starting and stopping with a single control lever and the ram can be positioned quickly and accurately for setting tools. Torque is said to remain constant throughout the operating life. (Cincinnati Shaper Co.)

Circle E-9 on page 65 for more data

Drafting Machine Scales

Being introduced on the market is a line of standard improved metal drafting machine scales under the tradename Duraline. The line consists of 12 standard types of graduations most used by engineers. Each style is available in six, 12, 18 and 24-in. lengths.



Universal drafting machine scale, Duraline.

Duraline scales are made of an aluminum alloy. The graduations do not extend to the drawing edge.

The scales are ground from solid aluminum flats in two operations, then engine divided at 70 F to produce graduations of high accuracy. After the graduations are blacked-in, a new anodized finish is applied that makes lines and figures stand out in contrast against the dull light gray of the metal. The chucks with which they are fitted permit their being used on any standard drafting machine. *Universal Drafting Machine.*

Circle E-11 on page 65 for more data

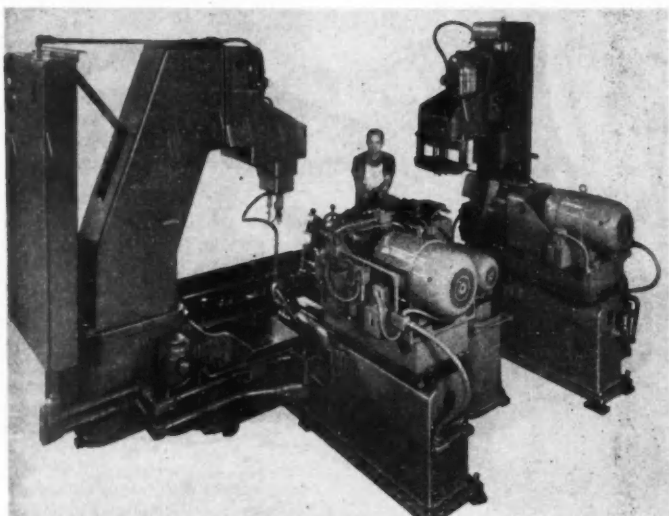
Drilling Machine for Tank Parts

A large special machine for processing suspension supports for Army tanks has just been completed. It is a five-way hydraulic-feed drilling machine with individual lead-screw tapping.

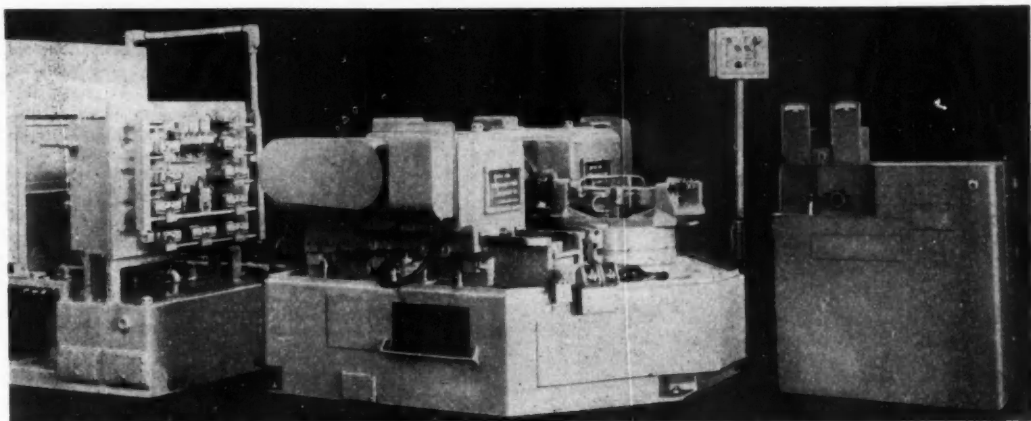
The holding fixture is mounted on a carriage, and is transferred manually from station to station as 11 drilling and chamfering operations and nine tapping operations are performed. One of its interesting features is, that at each station, the fixture is electrically interlocked with the machining cycle. Whenever the fixture is not properly positioned, forward cycle of machine cannot be started.

All hydraulic and electrical installations conform with J.I.C. standards. Machine ways are of tool steel, hardened and ground, and automatically lubricated. *Buhr Machine Tool.*

Circle E-10 on page 65 for more data



Buhr special drilling machine for tank components.



Match & Merryweather automatic connecting rod weight-balancing machine.

Weight Balance Milling Machine

Connecting rod balance can be held within two grams by a recently designed weight-balancing machine. Components of machine include a reciprocating table—rotating 180 deg and carrying two sets of work-holding fixtures, two opposed special quill type milling heads, mounted on hardened ways, and a Toledo scale unit housed in a floor-mounted cabinet, positioned at right angles to the machine.

To start the cycle, an overweight connecting rod is placed on the scale unit where each end is individually weighed about the fixed center of gravity and the amount of overweight is electrically transmitted to the machining unit. The connecting rod is then placed in the open work-holding fixture on the rotary index table.

After the cycle button is pressed, the index table rotates 180 deg to the

work point, where it is located and clamped. Two milling heads traverse approach to the piece and stop, while the locating probes advance until they contact the connecting rod. The milling head quills advance with the probes and continue to advance the additional amount necessary to remove the correct amount of metal from each end so as to bring the connecting rod within weight balance. The amount of quill advance has been pre-set on a positive stop by the overweight indicated on and transmitted by the scale unit. At the point the milling head quills are locked, and the two milling heads feed until the face milling cutters have removed the excess stock. When stock removal is completed, the milling quills and probes retract, and the milling heads rapid traverse return to the start position. The index table then ro-

tates 180 deg, whereupon the work-holding fixture unclamps and the operator removes the balanced piece.

Production rate is 320 pieces per hr with the cycle of the machine arranged to accommodate a higher rate of production, dependent upon the skill of the operator handling the work.

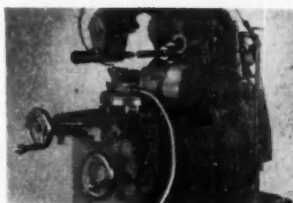
Movement of the milling heads, and of the probes and milling head quills is by hydraulic cylinder. The rotating of the index table and clamping of the work-holding fixtures are likewise done hydraulically. An external hydraulic tank, with motor, pump and control panel to J.I.C. Standards, is provided with the machine. Lubrication of all moving parts is automatic. *Match & Merryweather Machinery Co.*

Circle E-12 on page 65 for more data

Gear Hobber with Handwheel Operated Draw Bar Collet

Now included as standard equipment on Hamilton No. 1 gear hobbars (small, precision spur, spiral, bevel and face gears, worms and worm gears, gear segments and pinions) is a draw bar collet operated by a hand wheel. This collet is said to add greatly to the machine's production by reducing the time required for loading and unloading.

An additional feature of the new spindle design is the adjustable spindle nose which assures trueness



Hamilton gear hobber (Model No. 1), with a draw bar collet operated by a hand-wheel.

of the work piece to within 0.0001 in., and simplifies the necessary adjustment for trueness when a change is made from collet to work holding fixture.

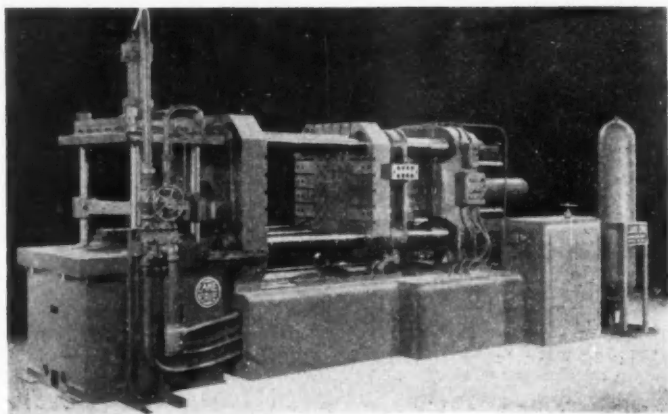
The identifying feature of the machine, independent selection of speed, feed, and indexing, is not changed by this present improvement. *The Hamilton Tool Co.*

Circle E-13 on page 65 for more data
(Turn to page 60, please)

NEW**EQUIPMENT****PLANT • PRODUCTION**

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(Continued from page 59)



Lake Erie die casting machine.

Die Casting Machine

An improved line of die casting machines has recently been released to the general market. Incorporating two exclusive features, the Wedge Cam Toggle and the Pressure-Pac injection unit, these models have been able to increase production as much as 15 to 25 per cent, according to the manufacturer.

The Wedge Cam Toggle is a self-compensating toggle clamp which automatically takes up clearances in the dies due to contraction and expansion of the molds during production or shut-down periods.

With the introduction of the Pressure-Pac injection unit it is claimed that denser castings result, as this new unit provides the necessary pressure to feed the shrink or compress the porosity at the time of solidification of the metal.

The standard Pressure-Pac unit is arranged for two to one pressure increase, but special units for higher ratios have also been designed.

This line of die casting machines is available in 10 models, ranging from 100 to 1000 ton capacity, for casting all the usual non-ferrous metals and alloys. *Lake Erie Engineering Corp.*

Circle E-14 on page 65 for more data

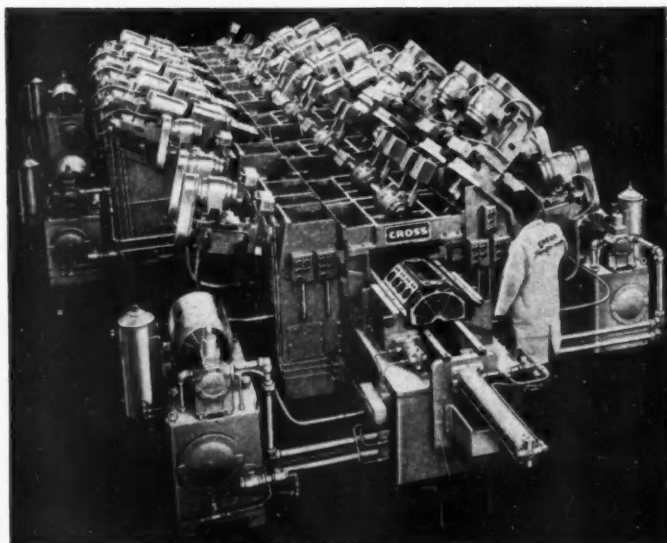
Transfer Machine for V-8 Blocks

For drilling and reaming V-8 cylinder blocks, a special automatic transfer machine has been created and built. The Transfer-matic requires only one operator to produce 82 cylinder blocks per hour at 100 per cent efficiency.

Work includes drilling and reaming the dipstick hole, drilling the oil feed holes for the heads, and rough and finish reaming the tappet holes. Fifteen stations are used—one for loading, three for drilling, four for reaming, one for cleaning and six for inspection.

A special feature is automatic gravity operated cam clamping of the pieces during the operations. Chips are automatically moved to a central disposal point by a conveyor. Lubrication is automatic. Electrical construction is to J.I.C. standards. Ways are hardened and ground. Hydraulic feed and rapid traverse are provided. Standard sub-assemblies are used throughout the machine. *Cross Co.*

Circle E-15 on page 65 for more data



Cross automatic transfer machine for V-8 cylinder blocks.

Material for Corrosion Protection

A material for the outside surfaces of plating rinse tanks requiring protection from acid spillage, plating salts, and other corrosive chemicals has been developed. A "putty-like" plastic paste composition, the product is said to provide an excellent protective coating.

It can be applied by hand trowel on any desired surface and to any thickness. In the case of the plating tanks, the coating is usually 1/16 to 1/4 in. This coating compound is made by adding a gelling agent to a paste based on Geon 121 vinyl resin, a product of B. F. Goodrich Chemical Co. Besides resisting most acids and chemicals, Geon is claimed to have good resistance to oils, greases, abrasion and aging.

Fusing the plastic putty coating is done either by oven baking or infrared lamps. It will reach a Durometer A hardness of 90-95. It can be applied safely, and there is no change in viscosity during storage. *Murray Products, Inc.*

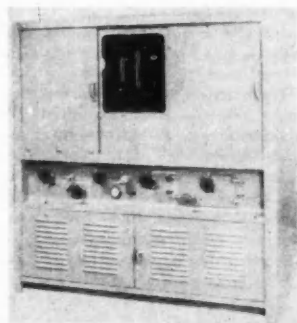
Circle E-16 on page 65 for more data

Pneumatic Test Stand

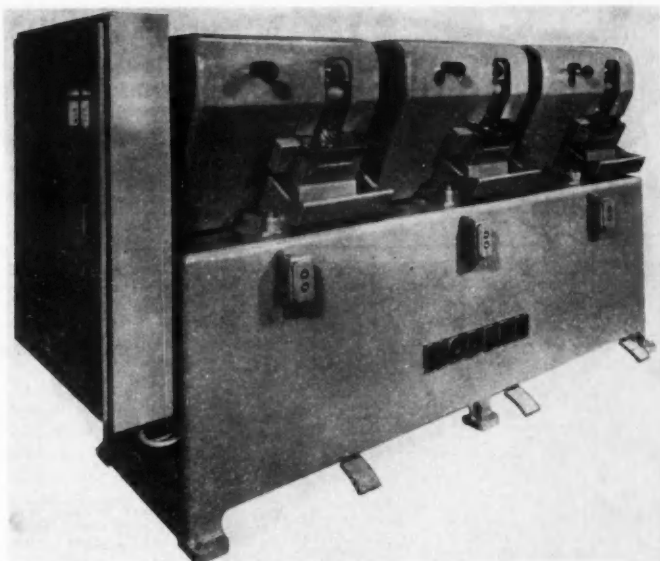
Now in production is a pneumatic test stand which performs functional tests on components of aircraft and guided missile pneumatic systems.

Model S-421 pneumatic test stand provides three separately regulated test outlets with ranges of 0-200, 0-2000 and 0-6000 psi. Two flowmeters, which measure leakage, have ranges of 0.01 to 0.24 cfm and two to 28 cu in. per min, respectively.

All components are mounted in an



Sprague pneumatic test stand.



Hypoid Pinion Chamfering Machine

A line of burring and chamfering machines for hypoid pinion teeth have been placed on the market. They are said to embody a considerable number of advanced features.

Simultaneous chamfering on the acute side and removal of burrs and sharp edges on the profile and considerable part of root on both toe and heel of all teeth as well as peripheral chamfer on large end, are the operations performed. Output rate is up to 300 complete hypoid pinions per hour per station per machine. The unit has safety interlocks and automatic gaging.

Shown in the accompanying illustration is the Model 2041, a three station Burr-Master for simultaneous chamfering of as many as three different hypoid pinions of different dimensions — one in each station. The three stations are identical except for detail tooling assemblies and the ratio of change gears. Each station is independently operated. (*Modern Industrial Engineering Co.*)

Circle E-18 on page 65 for more data

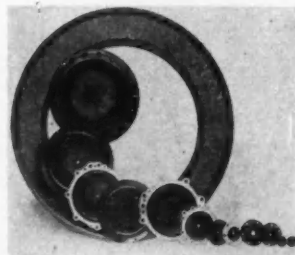
all-enclosed, steel welded and reinforced cabinet, measuring 72-in. wide, 36-in. deep and 74-in. high. The test area may be closed for safety by sliding the 1/4-in. thick steel doors. A two-in. thick, 20-in. by 20-in., bullet-proof glass window is provided for observing the tests being conducted. All controls may be operated with the doors closed.

The unit furnishes maximum static pressure of 6000 psi by boosting gas from a customer-furnished 2000 psi nitrogen cylinder with a Sprague Model S-3600-WB air booster. The booster, which operates from 100 psi plant air supply, is water cooled and water lubricated.

Pressures at stand inlet may vary from standard cylinder gas pressure (2000 to 2200 psi) down to 500 psi. Lower pressures than 500 psi may be used but will result in proportionately less booster efficiency. *Sprague Engineering and Sales Corp.*

Circle E-17 on page 65 for more data

Rubber Compound for Molding Diaphragms



Special rubber stocks for molding diaphragms of all types, with or without fabric inserts, from 1/4-in. up to three ft diam have been developed. These special stocks are compounded with properties that are said to effectively resist fluids and gases, extreme high or low temperatures, prolonged flexing, or combinations of these requirements. (*Acushnet Process*).

Circle E-19 on page 65 for more data

(Turn to page 62, please)

NEW

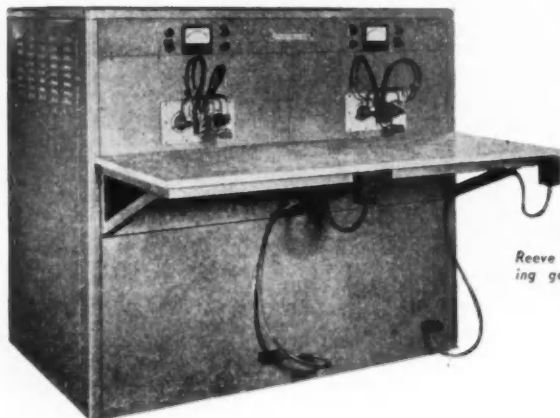
EQUIPMENT

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(Continued from page 61)



Reeve induction heating generator, Model L6F.

Induction Heating Generator

Another model has been added to a line of induction heating generators. Designated as the L6F, this two station five kw output generator is of the vacuum tube high frequency type. It features automatic air operated RF power transfer switch, built in multi-impedance RF output current transformers at each station, and step-less power output controls and precision timers for independent operation at each work station.

These generators are available with various types of work tables, mechanisms and fixtures, for soldering, brazing, hardening, annealing, forge pre-heating, etc.

The L6F weighs approximately 1500 lb, measures 57-in. high, 65-in. wide, and 42-in. deep. The power oscillator tubes are forced air cooled, a small amount of water is required to cool the tank coil and work coil. Power requirements are 240 or 480 v nominal, single phase, 60 cycle, approximately 10 kv-a at 95 per cent power factor under full load. Reeve Electronics, Inc.

Circle E-20 on page 65 for more data

Aircraft Cylinder Head Backspotfacing Machine

For backspotfacing 20 cylinder mounting holes in cylinder barrels and head assembly for radial aircraft

engines, a special-purpose, high-production machine has been brought out. Cutters are mounted in four

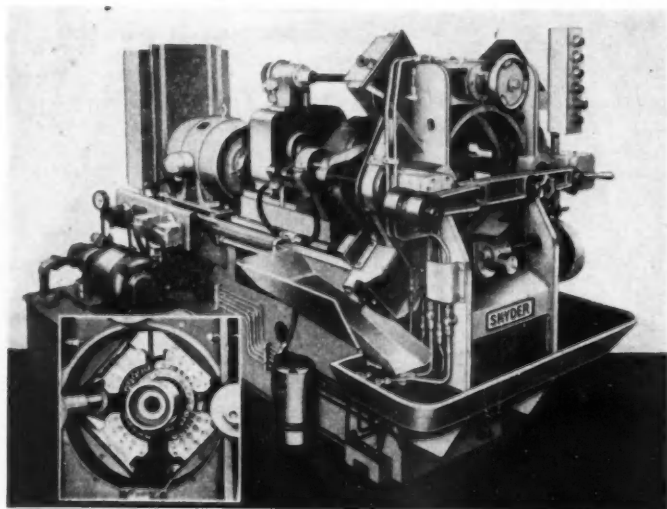
radially moving segments each containing five cutters which form a circle when the cutters are moved into working position. Segments are hydraulically actuated.

The part is located and clamped manually into the fixture which is mounted on heavy guide bars. Cutter segments move down into cutting position between the barrel flange and the lower portion of the cylinder head and the 20-spindle driver head is advanced manually until the cutters are engaged by the drivers which pass through the flange-bolt holes. The operator can also manually rotate the drivers into alignment with the splined holes in the cutters.

When the work cycle starting button is pressed, the fixture with the part feeds into the cutters until the cut is completed. The fixture then rapid returns to the starting position, the motor stops, the drivers are manually retracted and the finished part is ready to be unloaded.

The machine is semi-automatic and is fully safe-guarded for operation. Production rate is said to be very high. Snyder Tool & Engineering.

Circle E-21 on page 65 for more data



Snyder aircraft cylinder head backspotfacing machine.

NEW

PRODUCTS.

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 65

Small Gasoline Engine

Model K90, a compact, high horsepower engine, has been announced as available. The engine is rated at 3.6 hp at 3600 rpm. It weighs 44 lb.

Among the features of the K90 are anti-friction ball bearings at both ends of the crankshaft, accessible breaker points which are dustproof and moistureproof and externally mounted. The ignition system operates from a high voltage crankshaft magneto.

All K90 models have a precision oil-bathed fly-ball governor, glass sediment bowl with fuel shut-off valve, rotating screen, muffler, and oil-bath air cleaner.

Variations of the basic K90 engine design are available in the K90P which is built for direct mounting with a threaded crankshaft and K90R engine which is equipped with a six to one reduction gear. *Kohler Co.*

Circle P-8 on page 65 for more data.



Automatic Transmission Oil Pumps

Three models of automatic transmission oil pumps, each designed with a unique Alemite-engineered filter in the nozzle at the point of delivery, have been announced.

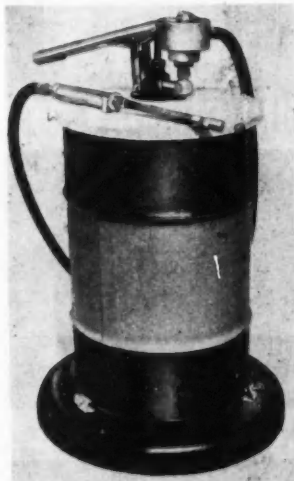
Besides the filter, Model 7076, which matches other units in the Visidrum line, features volume delivery through a meter which registers in quarts. The seven-foot hose with six-inch knurled handle, is equipped with a flexible extension nozzle which fits all cars. Protection against drippage is guaranteed by the positive manual shut-off, another feature of these models. An air eliminator is said to assure accurate delivery regardless of the level of the fluid in the container. This model is equipped with a white enamel cover

for the drum. The container is moved into position for use on a dolly fitted with four large Bassick casters.

Model 8121, which harmonizes with other shielded equipment in the Alemite Marshall line, is equipped with all of the features of Model 7076, such as the flexible extension nozzle which fits all cars and positive manual shut-off, plus push-pull handles on the sides of the shield.

Model 7039 is especially designed for use with bung-type drums. The pump fits into the two-inch p.t. bung of a 15 gal drum and has all of the features of the other two models with the exception of the cover for the drum. *Alemite Div., Stewart-Warner*

Circle P-9 on page 65 for more data.



Exhaust Eliminating Fixture

A Monoxivent Dual Exhaust fixture, designed to adapt existing exhaust eliminating installations to the new dual exhaust system on the 1952 Cadillac, has been announced.

The special Dual Exhaust adapter, J 5202, can be used with any overhead

or underground exhaust eliminating system having standard diameter exhaust pipe fittings.

The adapter is made of interlocked galvanized steel tubing. *Kent-Moore Organization, Inc.*

Circle P-10 on page 65 for more data.

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NEW PRODUCTS—Continued

For additional information please use
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Battery Chargers with Selenium Rectifier Circuits

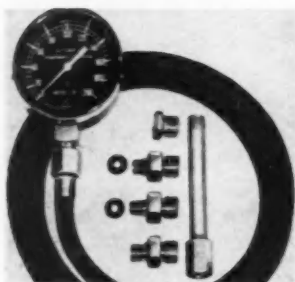
Four models of fast, slow and combination battery chargers have recently been introduced. Available in models for charging six v, six and 12 v, or six, 12 and 24 v storage batteries, the chargers are claimed to be very efficient, principally because of the unique design of their full-wave Selenium rectifier circuits.

The fast-slow combination charger, Model FBC, features effective high-speed battery charging, with automatic switch-over for long-lasting

finish-charging. There are four settings for fast- and medium-charge rate, as well as four different charging rates for slow overnight charging.

The full-wave Selenium rectifier is also featured in the line of slow chargers, Model RC, designed for use on batteries which require a continuous, slow, taper-charge. It is available in models for charging six or 12 v batteries. *Sun Electric Corp.*

Circle P-11 on page 65 for more data.



Automatic Transmission Gage

A universal gage for testing the oil pressure in all automatic transmissions is now being marketed. According to the company's announcement, the gage can also be used for checking engine oil pressure as well as testing transmission oil pressure, and provides a practical means of checking the accuracy of the oil pressure gage on the car, or for engines which are not equipped with a gage.

The instrument has an easy-to-read 2 1/4 in. dial face and a convenience hook on the gage. A 48 in. hose makes it possible to make readings while out from under the car. Three short connection fittings, one extension and one reducer make this gage adaptable to all popular automatic transmissions. *National Machine & Tool Co.*

Circle P-12 on page 65 for more data.



Automatic Headlight Beam Control

An automatic headlight beam control for motor vehicles known as the Autronic-Eye, is being made available. The Autronic-Eye is mounted behind the windshield and when it sees a bright light approaching, it dims your headlights and returns them to the bright beam as the car or cars pass. When driving on brightly lighted city streets, the lights

are automatically held on the lower beam. In addition, it is said to provide prompt glare relief, eliminating the necessity of proper beam selection by the driver at night, permitting him to give undivided attention to driving the car. The "Eye" includes a photoelectric unit. *Guide Lamp Div., General Motors Corp.*

Circle P-13 on page 65 for more data.



Universal Engine Governor

Dependable speed control for all popular industrial and farm engines is being offered with a recently developed long range universal governor. It is said to provide instant variable speed selection and correct engine control at any speed setting within 1200 to 2600 rpm. Higher speeds are obtainable by pulley adjustment. Operating spring and weight similar in any speed range.

For variable speed operation, a

quadrant or similar manual control sets governor to desired speed. Constant speed operation is provided by locking control lever at fixed speed.

The universal engine governor is claimed to be easily installed and it can be mounted on either side of the engine. Speed control lever, carburetor control lever and mounting flange fit either side of the governor. *The Pierce Governor Co., Inc.*

Circle P-14 on page 65 for more data.

including size, life, voltage, and cost of each lamp also are given. *Lamp Div., General Electric Co.*

Circle L-7 on postcard for free copy

Battery Connectors

Bulletin GB4-1951 is the title of a new publication covering type "GB" battery connectors. The 22-page bulletin covers the battery connector series used primarily for connecting and disconnecting starting equipment and widely adapted by the military services and general industrial fields. New technical data has been incorporated in this edition as well as new design features on types AN2551, AN2552, and a new fitting conforming to Navy-Buair specifications has been added. *Cannon Electric Co.*

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Electrical Insulation

A listing of manufacturers and suppliers of Class H electrical insulation components made with silicones is available. *Dow Corning Corp.*

Circle L-9 on postcard for free copy

Soldering Aluminum

The recent issue of the "Technical Advisor" contains an article on soldering aluminum. It points out the latest techniques and materials for this highly specialized operation. *Reynolds Metals Co.*

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USE THIS POSTCARD

Airframe Welding

Spot and seam welding in aircraft construction are featured in Vol. 3, No. 5 of "Resistance Welding at Work." It deals mainly with use of resistance welding at Northrop Aircraft on military planes. *Sciaky Bros., Inc.*

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Area Recording and Reproducing

A booklet, "Variable Area Recording and Reproducing Instruments," covers the applications and specifications of instruments for the analysis of seismic records. *Seismograph Service Corp.*

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Mechanical Remote Control

General descriptive material, as well as applications, on Teleflex mechanical remote controls is given in Catalogue 300. A typical control system also is described. *Teleflex.*

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Solenoid Pilot Valves

The design of a new line of solenoid pilot valves for air, vacuum, oil and water is fully described in a technical pamphlet, Folder P. Materials used for valve construction are also listed, and complete specifications of the various types of valves are included. *Valvair Corp.*

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Motor Design and Application

Design and application features of Life-Line motors (now made in ratings up to 700 hp) are described in a two-page booklet, B-4731. The special construction of motor frames, end brackets, stators, rotors, and bearings are described. *Westinghouse Electric.*

Circle L-15 on postcard for free copy

Temperature Input Control

A pamphlet has been put out that describes the XACTLINE straight-line temperature input control. Applications, working details, specifications are provided. *Claud S. Gordon Co.*

Circle L-16 on postcard for free copy

Precision Blending System

A 12-page folder describes the construction, operation, flexibility and wide application of a system for accurately blending two or more liquids in increments as low as 1/20 per cent. Sketches show simplicity and compactness as well as various types of installations. *Bowser, Inc.*

Circle L-17 on postcard for free copy

Electronic Parts

An 1100-page, 1952 general catalog listing over 75,000 items, with 7000 illustrations, of major electronic products has been published. It is complete with technical specifications, physical dimensions and prices. *Milo Radio and Electronics Corp.*

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FREE LITERATURE	NEW PRODUCTION & PLANT EQUIPMENT	NEW PRODUCTS
L-1 L-7 L-13 L-19	E-1 E-7 E-13 E-19	P-1 P-7 P-13 P-19 P-25
L-2 L-8 L-14 L-20	E-2 E-8 E-14 E-20	P-2 P-8 P-14 P-20 P-26
L-3 L-9 L-15 L-21	E-3 E-9 E-15 E-21	P-3 P-9 P-15 P-21 P-27
L-4 L-10 L-16 L-22	E-4 E-10 E-16 E-22	P-4 P-10 P-16 P-22 P-28
L-5 L-11 L-17 L-23	E-5 E-11 E-17 E-23	P-5 P-11 P-17 P-23 P-29
L-6 L-12 L-18 L-24	E-6 E-12 E-18 E-24	P-6 P-12 P-18 P-24 P-30

4/1/52

Your Name

Your Title

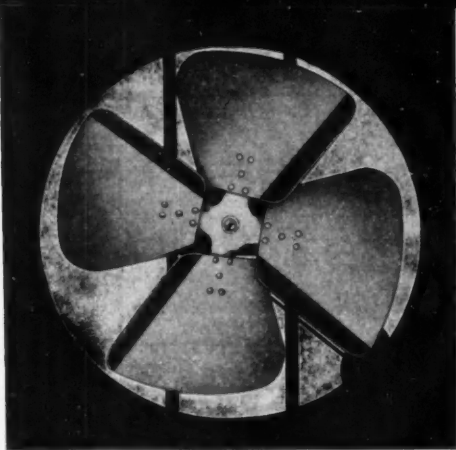
Your Company or Business

Address (No. & Street)

(City)

(Zone)

(State)



FRESH-AIR MAKER EXHAUST FANS

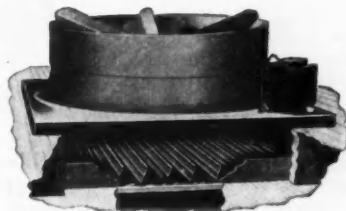
There's a model that fills the bill just right for a wide range of requirements—from 12" fan to 48" inclusive from 800 cfm to 25,000—all unexcelled for performance and durability—all economical to put in and operate. Many good engineering features in models specifically for horizontal operation.



61,500 cfm in roof of a non-ferrous foundry.



Ideal for conditioning separate shops or annexes—locate them in roofs, walls, windows.

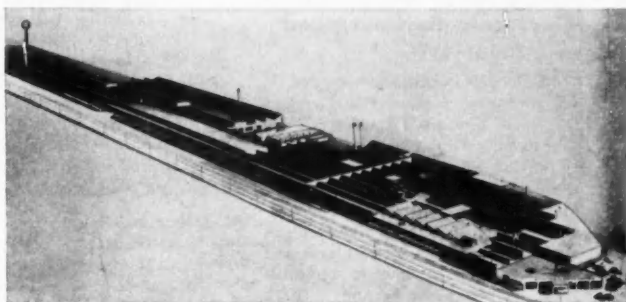


Horizontal Exhaust Fan Models proportioned for low head room, to lie flat in ceiling and discharge up or down—very thin, powerful, ball-bearing, mounted on rubber, 4200 cfm to 16,000 cfm inclusive.

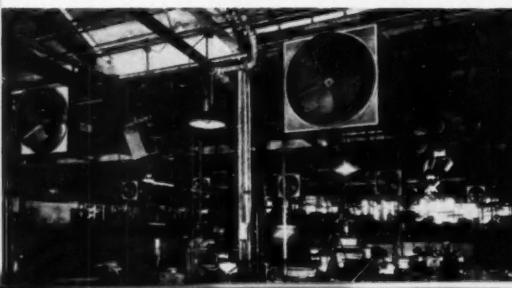


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Portable—Life savers for hot offices—Directs air up, down, under desk, into corners—completely portable.

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will surprise you!

You can transform an entire department into a well-ventilated, good place to work, boost morale and increase output with a few well-placed FRESH-AIR MAKER fans. They will take the heat, fumes, and general discomfort away from operations where heat is used in processing such as heat treating, forging, casting, ovens and tanks. FRESH-AIR MAKERS will pay for themselves so quickly where women are employed.

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AIRCRAFT PRODUCTS

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Under-Frequency and Overspeed Controls

An under-frequency control has been designed to trip the circuit breaker if alternator frequency drops below 360 cycles and closes the circuit breaker when the frequency is restored to 400 cycles.

Controls can be adjusted to a differential of two cycles, if required.

An overspeed safety control for internal combustion engines and turbos has also been developed, using the same basic principle. This control takes the speed reference either from the ignition system of the engine or the tachometer generator of the turbine. It shuts off the fuel and/or ignition, should overspeed occur.

It can be arranged for manual or automatic reset. *Electroquipt Controls, Inc.*

Circle P-1 on page 65 for more data.

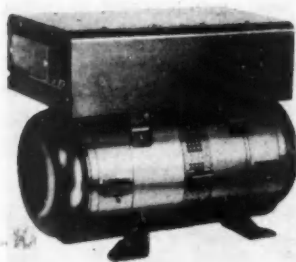
Electronically Controlled Inverters

Electronics have been applied in the control of frequency and voltage output of aircraft inverters. Using thyatron control tubes, it is said to be possible to control the frequency of these inverters within 2½ per cent, and the voltage within 3½ per cent. It is claimed that these inverters can operate at altitudes between zero and 45,000 ft, and at ambient temperatures between -55 C. and +71 C.

The tube chassis of these inverters are shock mounted. In anticipation of use in tropic zones and in coastal areas, the units have been fungicided and plated in points necessary to withstand salt spray.

These units are currently being produced in the 2500 v-a and 5000 v-a capacities and will soon add to their line several smaller sizes. *Eicor, Inc.*

Circle P-2 on page 65 for more data.



Eicor electronically controlled inverter.

Rectifier For Jet Starting

Especially designed to meet the power supply requirements of the Nation's newest jet bombers, a regulated selenium rectifier providing d-c for both jet engine starting and radio-radar checkout has been put out.

The pneumatic-tired ground power unit supplies a continuous d-c output of 1500 amp at 28. Automatic controls provide voltage regulation at better than $\pm \frac{1}{4}$ of one per cent from no load to full load with up to ± 10 per cent a-c line fluctuation. Recovery time is well under 0.2 sec with extreme load changes.

An unusual feature of the rectifier is said to be a multi-position selector switch to allow the operator to select the necessary voltage current characteristic for his particular testing or engine starting needs. *Inet, Inc.*

Circle P-3 on page 65 for more data.

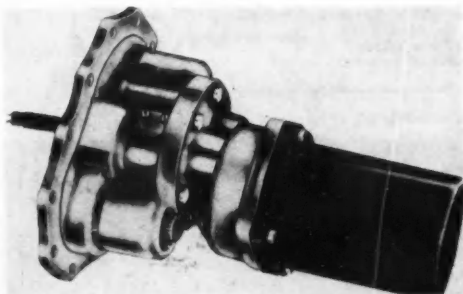


Inet power unit.

Water Injection Pumps

A series of water injection pumps have been developed for vertically, fully submerged mounting on the under side of a tank are used in conjunction with aircraft engine ADI systems. The flush-type mounting flange fits a standard AN4135 oval tank fitting, and is equipped with external relief valve adjustment as well as all fluid and electrical connections.

Adjustable range of relief valve is



Gear water injection pump for aircraft ADI systems.

GISHOLT'S easier operation

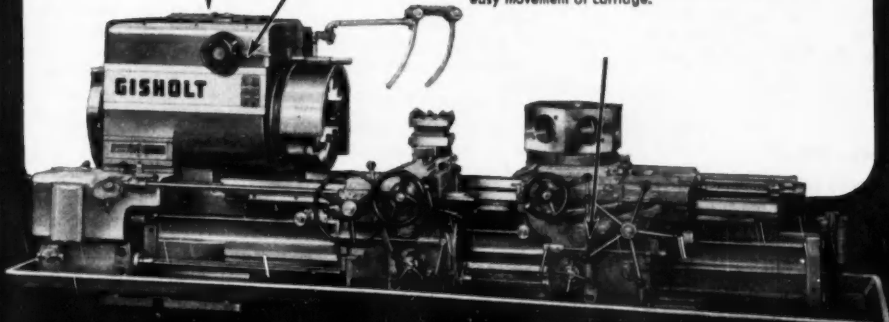
saves you time and money...



This 21,000 lb. machine requires no more operating effort than turret lathes $\frac{1}{3}$ its weight. Despite its great power and rigidity for heavy-duty work, the new Gisholt 4-L is so fast and responsive, it can handle light work of both large and small diam-

eters. With many machine functions entirely automatic, waste time is eliminated. Fatigue is reduced to a new minimum. Training time is shortened. Operator output is faster—more nearly constant throughout the day.

- 1 Hydraulic Speed Selector** eliminates manual gear shifting. Spindle speed changes are made instantly by power without stopping the spindle or releasing the main drive clutch. Can be operated either direct or pre-set.
- 2 Central control panel** eliminates manual effort. Provides responsive finger-tip, push-button control for start, stop, reverse, inching, chucking, and coolant supply. Automatic braking brings the work smoothly and quickly to rest.
- 3 Easy selection of feeds** is provided in the new single dial type feed selector control, making a complete choice of feeds immediately available. Aprons are fully enclosed. Automatic lubrication assures easy movement of carriage.



The new Gisholt 4-L Saddle Type Turret Lathe provides 31 $\frac{3}{4}$ " swing over the ways, 27" swing over carriage wing, 9 $\frac{1}{2}$ " to 12 $\frac{1}{2}$ " spindle bores and 63" longitudinal working travel of turret carriage to

accommodate an unusually wide range of work. Ask Gisholt engineers about this modern, easier operating Gisholt as applied to your specific machining requirements. New literature is available.

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TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

NEW



AIRCRAFT PRODUCTS

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20 to 45 psi. Pump displaces 0.523 cu in./rev. The unit is rated at 160 gph at 25 psi, and 9.2 amp at 27 d-c. Weight is 8.5 lb.

Motor is 1/5 hp, sealed for submer-sion, and is explosion proof. Radio interference is held below a level of 50 microvolts by a filter. A diaphragm shaft seal on the pump and a O-ring over the gear shaft prevent liquid from entering reduction gears and motor.

The hazard of Galvanic corrosion is claimed to be eliminated by insulat-ing the pump and other metallic parts of the unit with nonconditioning separa-tions, thus preventing antideionant solution from acting as an electrolyte. Castings are anodized aluminum alloy. The pump liner and rotor are Monel. Bearings and blades are Graphitar, which permit dry or wet low-friction running on the Monel metal parts. *Leav, Inc.*

Circle P-4 on page 65 for more data.

Automatic Pilot

An automatic pilot designed to re-lieve U. S. Navy fliers of 90 per cent of their "stick and rudder" work is in production. It is stated by the manu-facturer that the autopilot does just about everything a human pilot can do except actually take the plane off the ground and land it. It can be used in such maneuvers as gunnery runs on enemy aircraft.

Designated the G-3, the autopilot was developed by the company's Aeronautic and Ordnance Systems Division with the co-operation of the Navy's Bureau of Aeronautics. It is designed for use in such high-speed Navy jet fighters as the Douglas F3D-2 Skyknight, the Grumman F9F-5P Panther, and the Douglas A2D attack plane.

The G-3 will hold the plane auto-matically at the desired barometric altitude, heading and attitude. The pilot can put the plane through maneuvers he wishes by means of push buttons and a miniature control stick which moves under finger-tip pressure. When the human pilot

wants the autopilot to take over, he pushes a button and the device holds the airplane at the same heading and attitude it was in when the button was pushed. If this attitude is other than level flight, the automatic pilot will smoothly and automatically re-turn the airplane to level when an-other button is pushed.

The human pilot pushes still an-other button to hold the plane at the desired barometric altitude. By means of the miniature control stick located on the right side of the cock-pit, and using only light pressure, he can cause the plane to turn left or right, climb or dive in a smooth, co-ordinated motion.

In addition to providing auto-matic control of the plane, the G-3 also is used as a "yaw damper" dur-ing manual flight to stabilize the air-plane and improve its steadiness as a gun platform.

A unique safety provision prevents the human pilot from engaging the autopilot if the latter is not properly synchronized to the airplane's flight conditions.

Newly-designed, non-tumbling gyros permit the plane to maneuver through complete loops and rolls.

The G-3 system consists of a G-2 compass, a vertical gyro and a rate gyro which feed electric signals into an amplifier. The amplified signals are then applied to one or more of three motor-driven actuators which move the airplane's control surfaces. *General Electric Co.*

Circle P-5 on page 65 for more data.

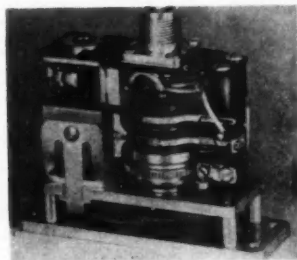
D-C Timer

A precision on-off direct current timer that can provide timing cycles from three sec to several minutes is being introduced to the trade. The timer has application for such opera-tions as limiting the operating cycles on jet engine igniters, to sequence or limit the operation of solenoid valves or other units where safety of equip-ment requires delays in frequency or duration of operation.

Accuracy of the timing mechanism is provided by a constant speed clutch. The timer automatically resets itself instantaneously upon interruption of current to the holding coil. A con-ventional shunt wound motor is used to drive the mechanism.

Adjustment of timing cycles from three to 90 sec can be made in the basic unit. Modification of the gear train can provide cycling up to sev-eral minutes. *Pacific Div., Bendix Aviation Corp.*

Circle P-6 on page 65 for more data.



Bendix Pacific d-c timer.

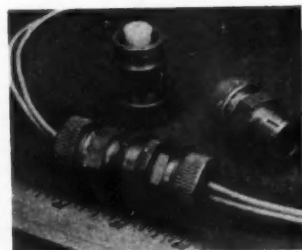
Electrical Connectors

Now on the market is a complete line of lightweight electrical con-nectors. Designed to meet special re-quirements of temperature, corrosion, and vibration, they are available for general use on all electrical equip-ment.

Connectors will be furnished in 17 shell sizes, conforming to AN sizes eight to 36 inclusive and can be fur-nished for various assemblies.

This lightweight connector is claimed to introduce an unusual method of assembly that allows for unlimited wiring arrangements. In assembly, a major production ad-vantage is that the terminals can be removed from the block to solder or crimp the wire or wires to the end of the terminal. *Titeflex, Inc.*

Circle P-7 on page 65 for more data.



Titeflex lightweight electrical connectors.



Have you heard?... 21 of 25
leading engine manufacturers using chrome rings
specify Perfect Circle
The Standard of Comparison

The application of solid chrome plating to piston rings, as perfected by Perfect Circle, more than doubles the life of pistons, rings and cylinders. Performance data will be furnished on request. Write Perfect Circle Corporation, Hagerstown 3, Indiana.

METALS

Shortages in the Metal Supplies for Civilians, as Forecast by Government Experts, Fail to Develop

By William F. Boericke

Metal Scarcities Ease

Crystal balls have cracked in Washington. Official forecasts that the second quarter of the year would witness the severest pinch in metal supply for civilian consumption have not been borne out by events. Instead of scarcities real concern is felt in many lines over surpluses and possible price weakness.

Government planning always leaves much to be desired. It will be readily admitted that the job is notoriously difficult and practically impossible except in a police state for the best intentioned, even the highest qualified experts. Considerable embarrassment is apparent because of the admitted easing of metal supplies after vehement official warnings that supplies were desperately short and would require rigid controls and shortened allotment to industrial consumers. These warnings appear to have miscarried. It seems clear that the official planners badly underestimated the enormous productive capacity of the country and quite as badly failed to appreciate that their constant references to imminent shortages would set up a wave of scare buying that resulted in many manufacturers overstocking their inventories. This explains the recent lull in buying even of metals that only a few months ago were reported to be critically short, with no relief in sight.

Now DPA somewhat reluctantly admits that in steel there is a tendency "to ease spottily," which in the opinion of some steel executives, is distinctly an understatement. True enough, copper supplies are still short, but premium prices abroad are fading. The lead supply has improved to such an extent that all restrictions on its use have been removed. Special High Grade zinc can be had for the asking. The spectre of a 1,500,000-ton annual rate of production of aluminum by 1953 has all metal producers nervous; even aluminum producers admit they see a selling job ahead for their industry.

Steel More Plentiful

Except for some special shapes steel is in steadily increasing supply. A survey of the industry indicates that nine out of 10 steel consumers have enough steel for their needs, and inventories are adequate. This is not true uniformly across the country, nor for all types of steel, but is sufficient to justify the belief that the situation might change rapidly from a sellers' to a buyers' market. Inventories of steel in the period when apparent shortages were being shouted from the housetop were apparently higher than was ever

suspected. For more than two months chrome stainless steel has been freed from all rationing, but decontrol has not aroused undue buyers' interest. Production of alloy steel, always excepting chrome-nickel, has been high and Allegheny Ludlum cut back its output of silicon steel in February. Sharon Steel shut down two open hearth furnaces early in March because of poor market conditions. Efforts to substitute straight chrome stainless for chrome nickel steel, the 18-8 type, have not been successful. The Government has been urging the use of boron, relatively abundant, as an alloying element instead of nickel and molybdenum. The outlook for large supplies of tungsten has improved and NPA has indicated that the present method of allocation may be revised in the second quarter to release more metal to industrial users. The foreign price is slightly lower than the OPS support price of \$65 per unit.

Recent trade news is to the effect that the smaller steel mills have been able to produce and deliver more flat rolled and wire products than they had tickets for and have been obliged to cut back their operating rate because of a lower volume of new orders. No more than a normal waiting period is needed to fill orders for cold rolled sheets, hot and cold rolled strip, and terne plate. Even structural steel is in better supply. As a result NPA is liberalizing some of its rules and regulations although decontrol still appears to be some time off.

Primarily the reasons for easier steel supply are, first, the peak production, which will reach the 120 million ton rate later in the year; second, cutbacks in steel-consuming civilian goods; and third, the failure of military use to pick up all the surplus that resulted from these cutbacks. This latter has been accentuated by the stretchout in the defense program for a larger period than was originally contemplated. It now seems apparent that the growth in direct defense requirements is not likely to equal the 20 per cent increase in ingot capacity that the steel industry expects to attain.

Lead Decontrolled

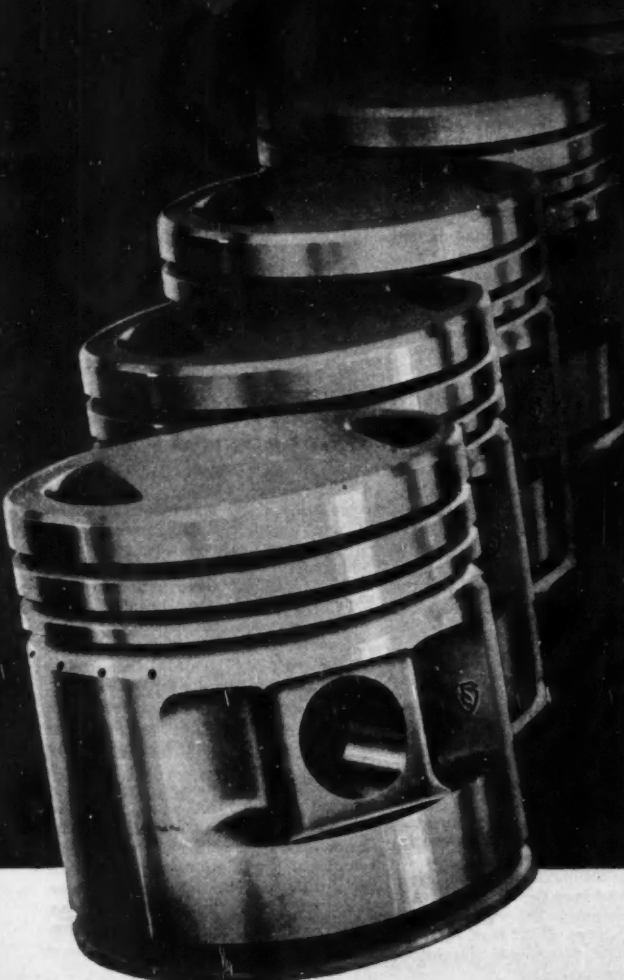
Running strictly according to precedent, lead has set the pattern for other non-ferrous metals in being the first to register a major increase in visible supply after an apparent scarcity, along with a marked easing in price. Lead premiums abroad have gone by the boards, in fact, foreign lead is being freely offered in the domestic market at ceiling prices or even a trifle less. Lead producers recall unhappily the spring of 1949, when the lead price collapsed in 10 weeks from 21½ cents to 13 cents per lb.

Lead is being imported in increasing amounts from abroad and the chances are that imports in 1952 will

(Turn to page 86, please)

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Observations

By Joseph Geschelin

LPG Use Expands

With the recent advent of Reo and IHC offering LPG-equipped vehicles at the factory, the era of shop engineered conversions gives way to factory designed equipment. The pioneers in this field, mainly in the West and Southwest, have paved the way for a wider and more economic exploitation of what is claimed to be an abundant and easy to obtain fuel. Assuming that engineering problems have been solved, the chief obstacle is that of fuel distribution. There seems to be no question, however, of availability if and when new areas of use are developed. One basic engineering problem that requires attention is the matter of piston ring break-in. Reo, for example, supplies an entirely different ring setup for LPG engines, designed to aid in early seating without scuffing of cylinder walls.

Multi Fuels

While in Washington recently we were told that the Army has requested engine builders to develop a basic engine capable of operation on any fuels available in the field. Evidently this is an entirely different unit from the "multi-fuel" engines that commercial engine builders have offered for many years. This one must be able to consume regular or high octane gasoline, kerosene, jet engine fuels, or Diesel fuel. More important, the engine must digest these fuels without the benefit of changing major parts or adding special accessories. At least that's the general idea. On the face of it, these requirements seem to be almost impossible of solution, judged by present standards. Yet the industry is taking on the problem and may come up with a reasonable answer.

Increased Flexibility

Although the modern transfer machine is a highly specialized single-purpose machine, recent developments prove that it is capable of considerable flexibility. It is obvious that equipment of this character tends to freeze design to a certain extent, certainly within the limits of amortization life. However, if the design of major parts such as cylinder blocks and heads is projected in advance and if provision is made to accommodate some future

change in the physical size of these parts, changeover can be made readily by replacing fixtures and heads. More recently, however, we have noted several machines designed to handle a family of similar parts by the expedient of introducing idle stations which can be fitted with suitable tools and cycled to handle another part. Still another example is a unit having sufficient length to accommodate the later introduction of additional heads to handle a similar part for next year's production. Thus the proper coordination of engineering and production planning can readily develop a great deal of flexibility in this type of single-purpose machine.

Anniversary Year

The procession of old, respected names is lengthening. This year marks the Golden Anniversary of Cadillac, Nash, and Continental Motors. Years ago Continental supplied many of the engines used in motor cars whose names now are just a memory. This year too marks the Centennial for Studebaker. Its history reaches back to the blacksmith and wagon days of the Studebaker brothers, founders of the present organization.

Nylon Booms

Little by little the progress of engineering applications of nylon is approaching major proportions. Spurring this activity is the pinch of critical materials, particularly with respect to bronzes for bearings and gears. Some time ago we mentioned the nylon gear application in the Packard Ultramatic. More recently we have found one of the motor car companies experimenting with nylon bushings for king pins. Although this is purely experimental and may be a long way off, it is of interest because of the exceptional durability experienced so far.

Tools or Machines

Obviously some of the people outside the industry talking about production problems appear ignorant of the difference between machine tools and tools and fixtures, which is unfortunate considering their influence upon what is done in Washington. Evidently the situation hasn't changed since pre-Pearl Harbor days. We recall preparing a report for the then OPACS (defunct after Pearl Harbor) on the defects in the "Reuther Plan" which was then being given wide circulation. Later we had to prepare another report explaining the difference between a drill press and a drill, between a milling machine and a milling cutter.

Diverse License Plate Sizes Block Integration in Bodies

In spite of the fact that automotive designers have been able to make such accessories as fenders, bumpers, windshields, luggage compartments, etc., integral parts of vehicles, they have been continually frustrated in their efforts to do the same with one common accessory—the license plate. Widely varying sizes of plates have, of course, been the primary obstacle in the path of treating them as a planned and integral part of body design. Thus, it has been impossible to produce any type of fixed, built-in mounting that would be universally applicable.

Fortunately, however, hope for a solution of this problem is found in the fact that numerous public officials are said to be backing a movement in behalf of standardization of plate specifications. The time may yet come when automobile manufacturers can do away with the highly adjustable brackets and frames in use today.

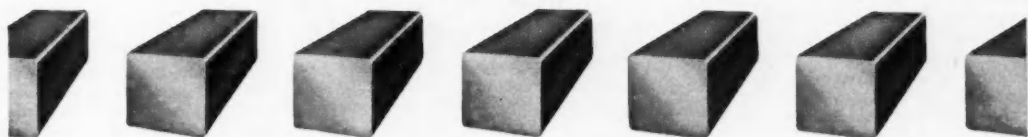
Consolidated Annual Report Shows Tax Effect on Profits

According to its recent annual report, Consolidated Vultee Aircraft Corp.'s profit for the fiscal year ended Nov. 30, 1951, was \$11,550,524 before federal taxes on income. Net profits after taxes amounted to only \$7,750,524. The company's net sales for 1951 approximated \$322 million, compared with \$256 million in 1950.

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quality, you get better and more uniform finished products. Rejects, delays and changes in shop practice are reduced.

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YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

AUTOMOTIVE INDUSTRIES, April 1, 1952

Russia's Jet Warplanes

(Continued from page 53)

versions. This design defect was remedied by fitting a tricycle undercarriage.

Numerous variants of this little fighter have appeared, including a two-seat jet conversion trainer after the style of the Canadair-built Lockheed T-33.

Production of the Yak-15 is now believed to be complete.

MIg-15—1947

The MiG-15 first gained notoriety in Korea, when its astonishing rate-of-climb and high maximum speed gave United Nation's pilots many a headache until the F-86 Sabre was introduced.

Generally speaking, the MiG-15 is considered a better all-around aircraft than the Sabre, and, like most other

modern fighters of the Soviet Air Force, carries large-calibre cannon as standard equipment. Meanwhile, the RAF and the USAF still cling to 20 mm. and .5 in. weapons of World War II vintage, long out-dated by the rapid advances in air armament during the past six years.

YAK-21—1948

Another strategic-area defender is the Yak-21, the post-war Russian version of the German Me-163 and Ju-8-248 rocket interceptors. With its HWK-509C development, this swept-wing fighter is said to be capable of speeds up to 900 mph for short periods. It is believed to be in limited production.

LA-15—1948

Semyon A. Lavochkin's La-15 is roughly the equivalent of the CF-100 fighter. It owes its basic design work to German World War II designer, Willy Messerschmitt. His Me-262 "Sturmvogel" was designated the La-13 by the Soviet Union, and put into limited production. A modified version known as the La-15, and fitted with Russian-built M-004 axial turbojets, followed. Latest production night-fighter variants incorporate swept-back wing and tail surfaces, and are powered by two 6600 lb static thrust M-012H engines.

Most recently reported armament are two 32 mm. cannon and two 12.7 machine guns, the attack-escort-fighter version carrying an all-cannon battery in the nose.

Pilots over Korea are rumored to have sighted a machine similar to the La-15, but no official confirmation of this fact can be obtained.

Rising production inside Russia itself indicates that this aircraft will form the nucleus of the USSR's night defense organization.

LA-17—1948

Like the MiG-15, La-17 was based on the German Focke-Wulf Ta-183/11, an advanced fighter designed in 1944 by Kurt Tank, currently working in Argentina. Experience gained in squadron service made the Soviet air force cut back production in favor of the more controllable MiG-15. Many La-17's are still in service, and radar "snoots" have been noticed on some versions flying in Germany.

YAK-25—1949

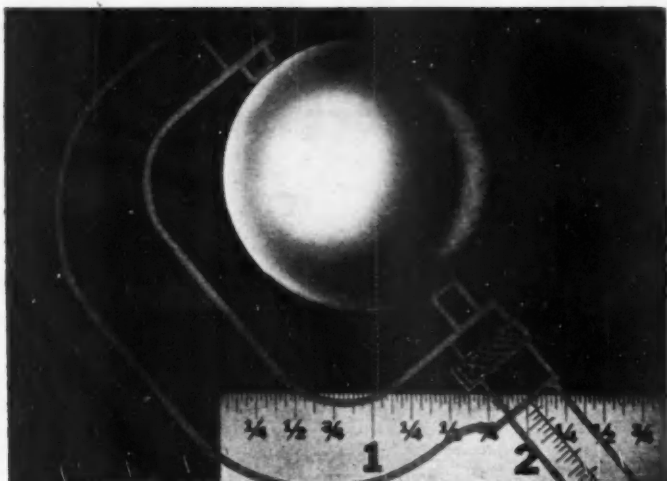
Reputed to be the fastest and best Red swept-wing fighter, the Yak-25 is now entering quantity production, and soon may be the standard first-line offensive and defensive weapon of the Soviet Union.

Unconfirmed reports from Korea state that the Yak-25 is of conventional design and uses a liquid-fuel rocketjet for increased thrust.

(Turn to page 78, please)

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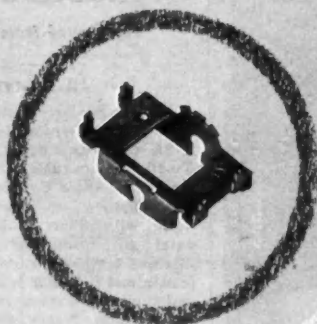
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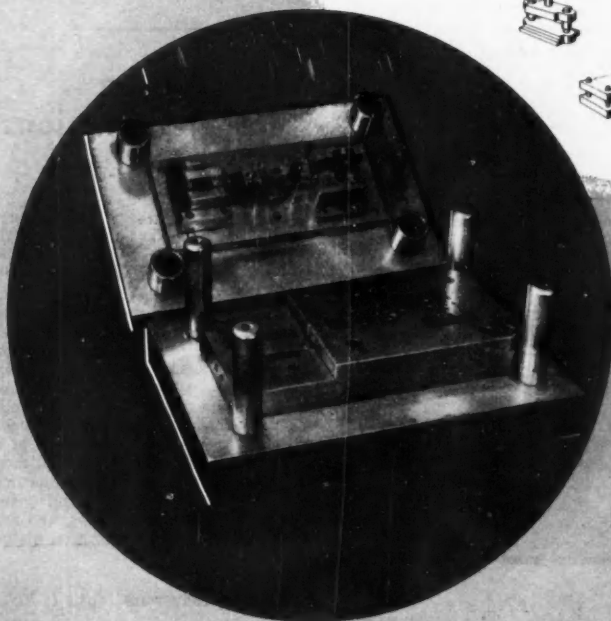
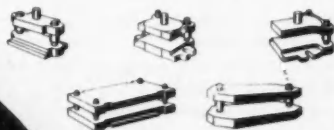
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- *CLEVELAND 14, 1550 East 33rd Street
- *DAYTON 7, 3196 Delphos Avenue
- *DETROIT 16, 1549 Temple Avenue
- *GRAND RAPIDS, 113 Michigan Street N.W.
- *INDIANAPOLIS 4, 5 West 10th Street
- *LONG ISLAND CITY 1, 47-28 37th Street
- *LOS ANGELES 54, Ducommun Metals & Supply Co.,
4890 South Alameda
- *MILWAUKEE 2, 111 East Wisconsin Avenue
- *PHILADELPHIA 40, 511 W. Courtland St.
- *ROCHESTER 4, 16 Commercial St.

†Indicates complete stock





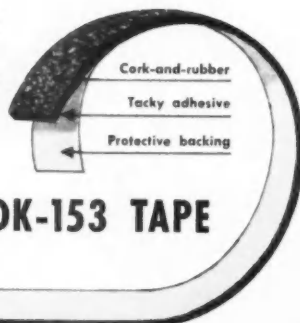
"This won't scratch anybody's desk"

Your product won't scratch anything either if you stick suitable pads of Armstrong's DK-153 Tape on it. Neither will it slip around on polished surfaces.

Armstrong's DK-153 is a sponged cork-and-rubber composition made in tape form (or in die-cut shapes). A tacky adhesive is already on it. You simply peel the cloth backing from a piece of the needed size or shape and press it into place. It sticks to almost any clean, dry surface.

DK-153 Tape comes in various thicknesses and widths. Its cork content makes it a good anti-skid, anti-squeak material, too.

For samples, write on your company letterhead to Armstrong Cork Co., Gaskets and Packings Dept., 8504 Arch St., Lancaster, Pa. Available for export.



ARMSTRONG'S DK-153 TAPE

Russia's Jets

(Continued from page 76)

IL-24—1949

Latest Soviet tactical bomber in quantity production is the 580 mph IL-24, more commonly designated the Tu-10. Comparable in size to Britain's English-Electric Canberra, latest variants of the IL-24 are reported to be fitted with Shvetzov-developed M-018 axial turbojets. With afterburner fitted, a static thrust of about 7700 lb is attained for each unit. Early bomber and trainer versions were powered by two Chelomy-Nenes (M-45's) of over 6500 lb static thrust each.

LA-26—1950

Tentatively designated the La26, this latest Soviet medium bomber is at present in the process of being delivered to operational units. Aerodynamically similar to the USAF B-26 Marauder, the La-26 is reputed to be Russia's short-range atom carrier. Naval units are also interested in this type as torpedo-bomber replacement for the piston-engine Il-4. Sergei Vladimirovich Ilyuskins' experience in this field might be a corroboratory factor for the designation Il-26, quoted by some observers.

MIg-19—1951

Big Russian surprise of this year was the introduction of new fighter bearing a very close resemblance to the German Tank-designed Ta-183 of World War II. It is likely that the MIg-19 was one of the high-speed 'all-swept' jets shown at the July, 1951, Moscow air display.

Allison Tank Transmissions

(Continued from page 36)

and chordal distance is held to plus 0.005 in., minus 0.000 in.

Arrangements are being made to complete the installation of the well-known Roto-Finish, wet tumbling technique for deburring the large case sections. At the present time the cases are burred and polished by hand, as has been customary in aircraft practice. Allison will have in operation shortly a battery of tumbling barrels, 48 in. in diameter and 6½-ft long, which will accommodate two cases at a time. Deburring will be accomplished in a cycle of but 30 minutes, eliminating arduous manual work, releasing operators for more important jobs, and reducing the cost of the operation materially.

AUTOMOTIVE INDUSTRIES, April 1, 1952

another case where welded steel tubing does the job best . . .



what **ELECTRUNITE** steel tubing
did for shock absorber manufacturers
it can do for you...

Today's airplane-type automobile shock absorbers are high-precision devices. They give years of service with practically no maintenance or attention. What's more, they cost . . . and weigh . . . much less than the old-style shock-absorbers that required new webbing or new springs or replacement all too often.

Today's hydraulic shock absorbers use large quantities of **ELECTRUNITE** Steel Tubing . . . the welded steel tubing that provides plenty of surplus strength to stand rough service under severe loads for many types of devices.

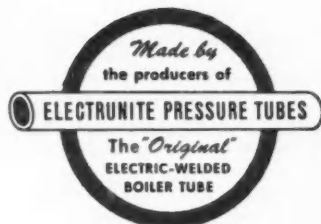
The extremely close ID and OD tolerances of **ELECTRUNITE** Steel Tubing enable manufacturers to use it without expensive preliminary reaming or finishing. Surfaces are clean, concentric, free from defects. It's produced in carbon, alloy, and stainless grades, in a wide range of sizes, wall thicknesses, and lengths.

If you'd like more information about how **ELECTRUNITE** Steel Tubing is helping a wide variety of manufacturers and products, write to:

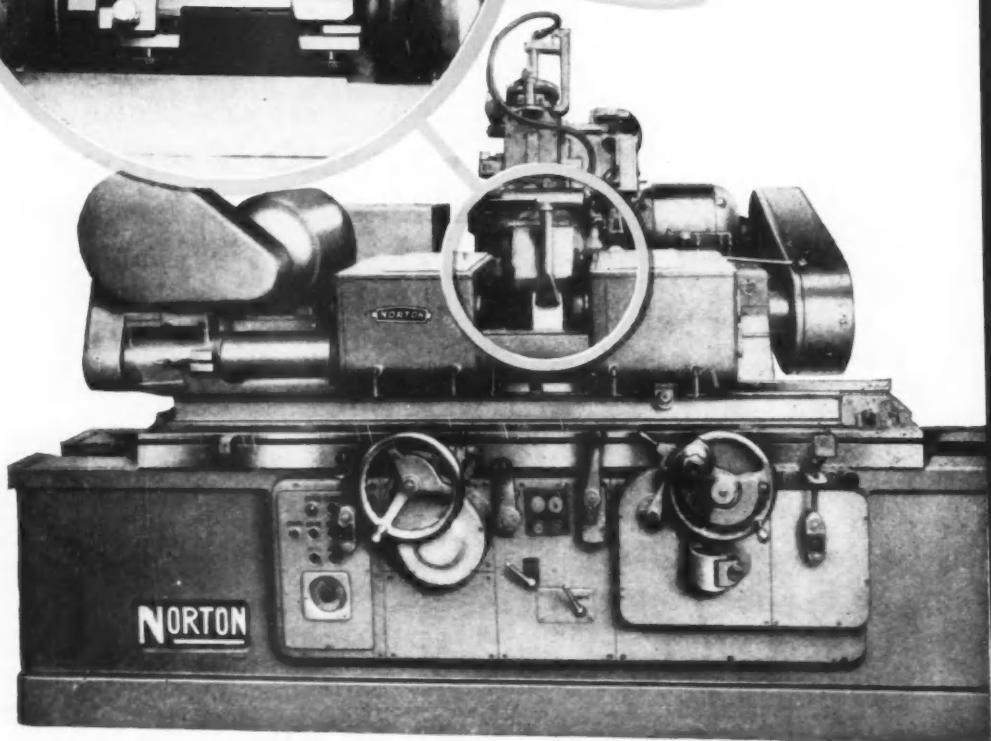
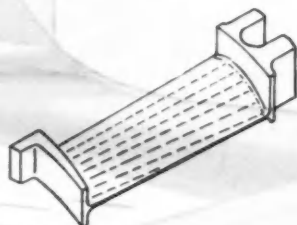
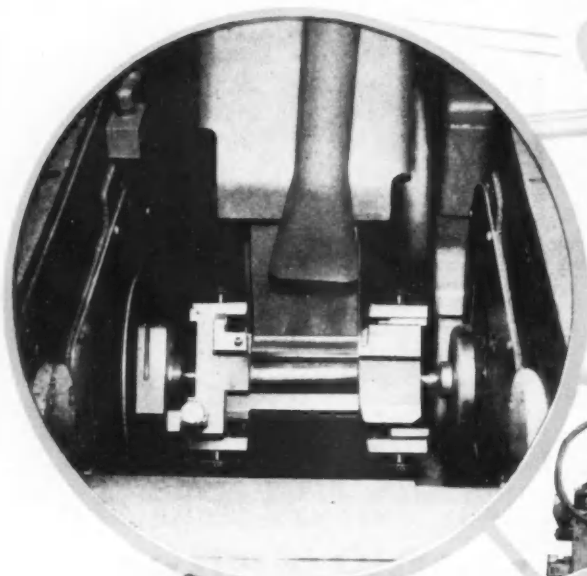
REPUBLIC STEEL CORPORATION

STEEL AND TUBES DIVISION

224 EAST 131st STREET • CLEVELAND 8, OHIO



One-plunge Grind for the External Airfoil Surface of Turbojet Buckets or Blades on the

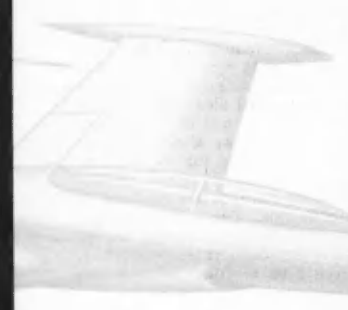


Making better products to make other products better

NORTON COMPANY, WORCESTER 6, MASS., U. S. A.
DISTRICT SALES OFFICES: HARTFORD • NEW YORK • CLEVELAND • CHICAGO • DETROIT

NORTON Compound Contour Jet Blade Grinder

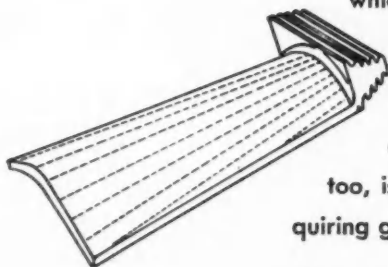
[Patent Applied for]



The complicated engineering problem of grinding jet engine buckets and blades having twisted contour but with straight line fairing has been solved.

The NORTON Compound Contour Jet Blade Grinder plunge grinds blades semiautomatically with a positive control of contour and finish of the external airfoil surface.

An ingenious arrangement of cams in dual shape-producing units provides the precisely correct motion for the workpiece which presents the surfaces to be ground at the horizontal centerline of a wide grinding wheel.



This set-up permits efficient grinding, high production and consistently high quality. Important, too, is the fact that all this is accomplished without requiring great effort or skill on the part of the operator.

This unique, new NORTON design includes many important engineering features and principles proved in the NORTON Type CTU line of cylindrical grinding machines.

If you, too, have the problem of obtaining high production and consistent accuracy combined with ease of operation in grinding complicated shapes, our engineers will be glad to provide specific recommendations—at no obligation to you.

To Economize
Modernize
with NEW

NORTON

GRINDERS and LAPPERS

Building World's Biggest Bombers

(Continued from page 41)

times from the time it leaves the bucks to its arrival in major mating.

There are 31 monorail cars on the assembly line and two others in the hangar building. They are capable of moving any major component of the B-36 short of the entire plane itself.

A slightly different tooling concept is required on the B-36 because it is not a high production-rate airplane yet thousands of different parts go into

each ship. At the outset of production, due to the original small number of airplanes ordered, the number of tools was kept to a minimum—simple in design but built in such a way that they could be changed and augmented for higher production. When orders for the B-36 increased, improvements were added to the original tool structures. The result was a production tool created without duplication of effort.

Comparatively few tools per part were fabricated to produce the first 13 B-36s. Since that time the tools per part average has increased somewhat but the ratio is still phenomenally low for the aircraft industry. It has been maintained in part by standardization of special mechanical press parts, maintenance of standard dies usable on numerous parts, and use of a joggling machine developed at Convair which eliminates joggle dies for 85 per cent of all joggled parts.

Dual mating stations are operated on the assembly line. The current mating schedule requires a minimum of master tools but under accelerated production, tooling could be modified to meet the production rate.

The safety factor is one which assumes major importance on the B-36 assembly line. Because of the airplane's size, workers are usually so high off the assembly floor, that a serious—sometimes fatal—accident may result from a fall. As a result, it is necessary to make more elaborate work stands. Convair's accident rate has been notably low.

Essentially, most of the problems involved in putting this mammoth bomber together are similar to those encountered with other planes. Differences are merely a matter of degree. Because of the relatively low delivery rate, the manufacturing cycle is longer. The great number of different shop-made parts (68,000 part numbers, often with two or three parts to a number because of right and lefts, and duplicate usage) and different assemblies (8500) for each airplane merely add to the volume of troubles rather than change their complexion.

Changes, rather extensive because of the inherent size of the airplane and the relatively low production volume, cause the normal disruptions to production.

Despite these disruptions and the magnitude of the assembly problem, Convair is continuing to produce B-36s on schedule for the Air Force's Strategic Air Command.

Quiet Gears

(Continued from page 52)

It may be noted that marine engines, unlike Chrysler passenger car engines, have a timing gear drive in which the camshaft gear is crown-shaved while the two mating timing gears are straight-shaved on Red Ring gear finishers. Here the Elliptoid-shaved camshaft gear provides the necessary alignment with the two mating gears, prevents edge loading due to misalignment, and serves as an aid to engine quietness and durability.

Expertly machined HARDENED & GROUND PARTS

THE sleeve shown here is a large piece and represents an exacting job—the kind we handle well. It calls for accurately hobbled threads over the full length . . . a polish-ground bore concentric with the pitch diameter of the threads . . . tolerances that challenge our ingenuity and skill.

Brown Hardened and Ground Parts have served the automotive industry for more than 40 years. In that time we've gained invaluable experience in precision machining, scientifically-controlled heat treating and micro-finish grinding. These capable facilities are at your command. Merely send us your prints; write or wire your requirements.

Henry W. Brown
PRESIDENT

Experienced production on . . .
King Pins • Shackle Bolts • Shackle Pins
Brake Anchor Bolts • Countershafts
Idle Shafts • Stub Axle Shafts
Steering Ball Bolts
Beam Bolts and Bolts
5th Wheel Rocker Shafts • Wheel Studs
Water Pump Shafts
... anything in the hardened and ground line, of any analysis steel, up to 41
diameter.

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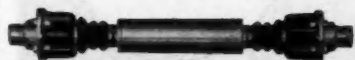
You Don't Buy Universal Joints Like Nuts and Bolts



Unless universal joints are designed for specific power transmission requirements, vehicle performance and the service life of the driveshaft are penalized. "DETROIT" Universal Joints are precisely engineered to deliver maximum torque smoothly to the rear wheels, yet provide thousands of miles of trouble-free service.

Detroit

UNIVERSAL JOINTS



UNIVERSAL PRODUCTS COMPANY, Inc., Dearborn, Michigan

**prompt...
direct
delivery...
safely into
your
hands**



PRP can deliver plastic moulded parts directly to your door, geared to your production schedule. Our fleet of trucks and private planes provides this unique plus service which prevents shipping damage and production hold-ups. Other PRP services include designing, tooling, and production in small quantities, or in millions. Telephone or write us about your problems. Or, if you prefer, our plane will speed you here to see our facilities and discuss your problems.

When you look for plastic mouldings, look first to
Plastic Research Products,
Urbanā, Ohio

PRP

MACHINERY INDUSTRIES

(Continued from page 54)

chine tools and other production equipment. It is designed primarily to promote plant safety.

New Process for Unground Hobs

It has been revealed that Michigan Tool Co. has in full operation a new process for the manufacture of accurate unground hobs to close tolerances. While details of the process have not been released, the company claims that the method does make it possible to use unground hobs in many applications where only ground form hobs were formerly considered suitable.

Hobs produced with the new process—both single and multiple-thread types—are no higher priced, according to the producer, than "accurate unground" hobs previously manufactured by the company. Unground roughing hobs also are being produced.

SR-4 Conference

A conference was held by Baldwin-Lima-Hamilton Corp. in Washington, D. C. on the SR-4 bonded wire strain gage just a few days ago. The well attended meeting featured a new sound film, "The SR-4 Strain Gage at Work." There were several interesting technical sessions including a session on individual case histories. Frank G. Tatnall, Baldwin manager of testing research, was the conference chairman.

Massey-Harris to Build Distribution Center

Massey-Harris Farm Implement Co. is planning a \$500,000 distribution branch at Springfield, Ill., to service more than 200 retailers throughout Indiana. The plant will comprise between 70,000 and 80,000 sq ft of space.

Jack & Heintz Gets Tank Starter Order

Jack & Heintz, Inc., has received a defense order from Continental Motors Corp. to build tank engine starters. The contract, which amounts to \$462,977, calls for delivery of starters to be installed on the tank engines that Continental is building as a Cadillac supplier and which are used on General Patton and Walker Bulldog tanks.

GITS Unit^{*} SEAL *Now* **STANDARDIZED**



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Automotive Accessories
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*Cartridge Seal... pressure balanced... requiring only 25% more space than lip-type seals.

If you have a shaft sealing problem, Gits experience in these and many other specific applications can prove of great and immediate value to you.

Write today for FREE illustrated Brochure, or send us your seal problem.

GITS BROS. MFG. CO.

1870 S. Kilbourn Ave. • Chicago 23, Ill.

Gits Lubricating Devices,
The Standard For Industry For Over 40 Years



METALS

(Continued from page 72)

be nearly twice the 1950 tonnage. Besides the 30,000 tons brought in from Great Britain under the Churchill agreement, an additional 20,000 tons has been contracted from the British Ministry of Supply at the 19 cent ceiling price. This metal will probably go to the stockpile as ample lead appears available for industry. Permissible consumer inventories have been increased to 60 day, supply against 30 days previously.

In spite of an estimated U. S. lead supply in 1952 of some 1,300,000 tons against estimated consumption of 1,130,000 to 1,200,000 tons, which could leave an apparent supply of about 100,000 to 170,000 tons, no pronounced price weakness is foreseen similar to 1949. For one thing, the 1 1/16 cent tariff would be automatically re-imposed if the price broke below 18 cents per lb for more than a month. Furthermore, no large new supply of lead is in sight from lead deposits either in this country or abroad. Lead production costs are much higher than pre-Korea and any drop in the domestic price would put many small marginal pro-

ducers out of business. Finally, increased activity in the automotive industries which seems imminent means a large battery demand and more lead needed for the battery manufacturers. Shipments of batteries in January of 1,534,000 units were down sharply from the same month of 1950 when they totaled 1,873,000 units. Requirements for manufacturers of tetraethyl lead gasoline will undoubtedly be stepped up sharply with lead controls removed and spring on the way.

Special High Grade Zinc In Supply

Cutbacks in the automotive industries in 1951 caused a sharp drop in the amount of zinc that went into die castings. Consumption in this important sales outlet declined from 281,000 tons in 1950 to 226,000 tons in 1951. This affected Special High Grade Zinc which has been in easy supply for several months, but Prime Western is still in strong demand.

Foreign price premiums on zinc are rapidly disappearing. From 30 cents per lb that was paid in Europe as 1952 opened the foreign price has declined to 21½ cents with demand hesitant. It seems almost certain that foreign zinc markets will follow lead and settle at near the domestic ceiling price. Larger zinc supplies are expected for the balance of the year, both from domestic mines and from abroad. So apparent is the easing in the world zinc supply that quotas may be abandoned and the International Materials Conference may consider abandonment of the allocations system after July 1.

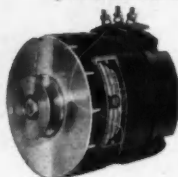
Chile Reconsiders Copper

Thus far no sign appears of any overproduction of copper either in the United States or abroad. It is still the scarcest of the major metals. But premiums paid in foreign markets have declined although the foreign price is still substantially more than the domestic ceiling. Since the first of the year the price abroad has slipped from 40-45 cents per lb to 35-40 cents with buyers evincing little interest in third quarter delivery at this price.

Definite indication that the bloom is gone in the European market for copper was shown by reports that Chile was ready to renounce its agreement made with the United States in the spring of 1951, under which it was stipulated that it should retain 20 per cent of the copper output of the American-owned companies to sell for its own account in Europe. This it was able to do in 1951, realizing about 54 cents per lb for the metal and clearing a handsome profit of nearly 100 per cent over the price paid producers. Unhappily this situation has gone and Chile now appears willing to accept a guaranteed 33½ cents per lb to be paid by the Government or by the companies rather than accept the dubious possibility of

You're sure of the BEST- when you specify **Leece-Neville**

Since 1910, Leece-Neville has been known as the pioneer and leader in design and manufacture of high quality, heavy-duty automotive electrical equipment. You can specify Leece-Neville with complete confidence that you will get the ultimate in performance and durability.



L-N ALTERNATOR SYSTEMS

Include dry-plate rectifier. Capacities from 50 to 175 amps. for 6, 12, 24, 32 volt systems.

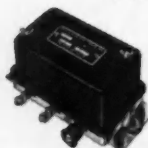


L-N LOW-CUT-IN DC GENERATORS

60 to 2100 watts. Types available for all requirements.

L-N CRANKING MOTORS

Heavy-duty construction for quick, dependable starting. ½ HP to 27 HP.



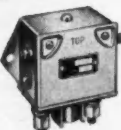
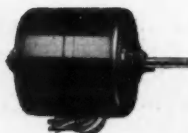
L-N REGULATORS

Patented, double-contact, long-life design, hold voltages to close limits.



L-N FRACTIONAL HP MOTORS

Standard production includes ¾" to 1½" stack, for 6 or 12 volts. Other designs and voltages available.



L-N SWITCHES

Hand and magnetic for standard and series-parallel systems.



THE LEECE-NEVILLE COMPANY • Cleveland 14, Ohio





Lacquer

PUBLISHED PERIODICALLY BY HERCULES POWDER COMPANY IN THE INTERESTS OF BETTER FINISHES AND FINISHING

New Ford Plant to Use Hot Lacquer For Finishing Army Tanks

*Hot-Spray Process Avoids Installation
of Baking Ovens in
Ford's Livonia, Mich., Assembly Plant*

The decision of Ford's Tank Division to use hot-spray lacquer exclusively for finishing tanks at its new Livonia, Michigan, plant points up, once again, the advantages offered by this time-saving and money-saving process. This fast-drying system, developed by The Ordnance Corp, includes a new nitrocellulose base primer, MIL-P-11414 (ORD).

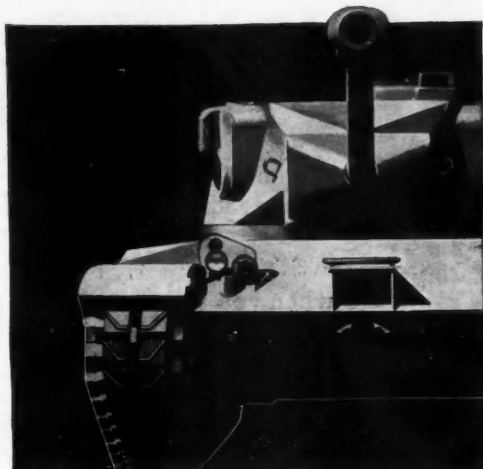
The enthusiastic switch to hot lacquer in defense and other industries stems from the following reasons:

- finishing time is cut by as much as 50%
- expensive baking equipment is unnecessary
- Every pass of the spray gun assures more solids . . . greater thickness
- fewer coats are needed
- less solvent is used
- coverage per gallon is increased
- finish has better flowout
- blushing is eliminated

HERCULES POWDER COMPANY

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Cellulose Products Department
964 Market Street, Wilmington 99, Delaware



You'll want to read about the broader uses of lacquer for finishing defense items—and your own products. New military specifications for lacquer and primer are now issued and official. Identified as "Military Specification MIL-L-11195 (ORD) Lacquer, Lustreless, Hot-Spray (For Ammunition)" and "MIL-P Primer, Lacquer, rust inhibiting." Hercules will send you full information on hot lacquer, types of heating equipment available, and the performance record of hot lacquer in many industries. Send for it today.



CL52-2

HERCULES DOES NOT MANUFACTURE LACQUERS OR HOT LACQUERS FOR SALE ONLY THE EQUIPMENT FROM WHICH LACQUERS ARE MADE

even though you bought it for...



... **in labor** to assemble it into **your product!**

And when you use such fasteners by the thousands you can be adding **TOO MUCH** to your product costs.

Now you can use Midland Weld Nuts in assembling *your* product—wherever "Blind Spots" slow assembly operations, wherever you're using two men now to tighten a single bolted connection.

MIDLAND



The MIDLAND STEEL PRODUCTS COMPANY

6660 Mt. Elliott Ave. • Detroit 11, Michigan
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**AUTOMOBILE AND
TRUCK FRAMES**

**AIR AND VACUUM
POWER BRAKES**

**AIR & ELECTRO-PNEUMATIC
DOOR CONTROLS**



obtaining a still higher price in Europe.

The long term outlook for the copper price appears to be in line with the guarantees given to new producers at Washington. These range from 23½ cents to 25½ cents per lb. In the latest agreement made with the Copper Range Co. for new production at its White Pine mine, the Government guarantees \$28.5 million to be paid for copper at 25½ cents per lb over a 10-year period if the metal cannot be sold to domestic buyers at a higher price.

GM Research Develops New Lacquer Thinners

New significant formulas for lacquer thinners are improving automobile finish quality, according to a recent report from General Motors Corp. Research Laboratories. It is said that the new concept of lacquer thinner, now applied in GM automobile divisions, has improved both the technique and results of applying lacquer to car bodies.

Several years ago GM Research Laboratories began testing lacquers in which the diluent portion of the thinner had a low boiling point. Thus, virtually all of it evaporated between the time the lacquer left the spray gun and the instant it hit the car body.

The solvent portion of the thinner was composed of higher boiling material so that, in drying, the lacquer film on the body had a tendency to flow slightly. The new formulation with low boiling diluent and high boiling solvent reportedly eliminated the tendency of a finish to "orange peel." In production, "orange peel" on car bodies is eliminated by surface polishing.

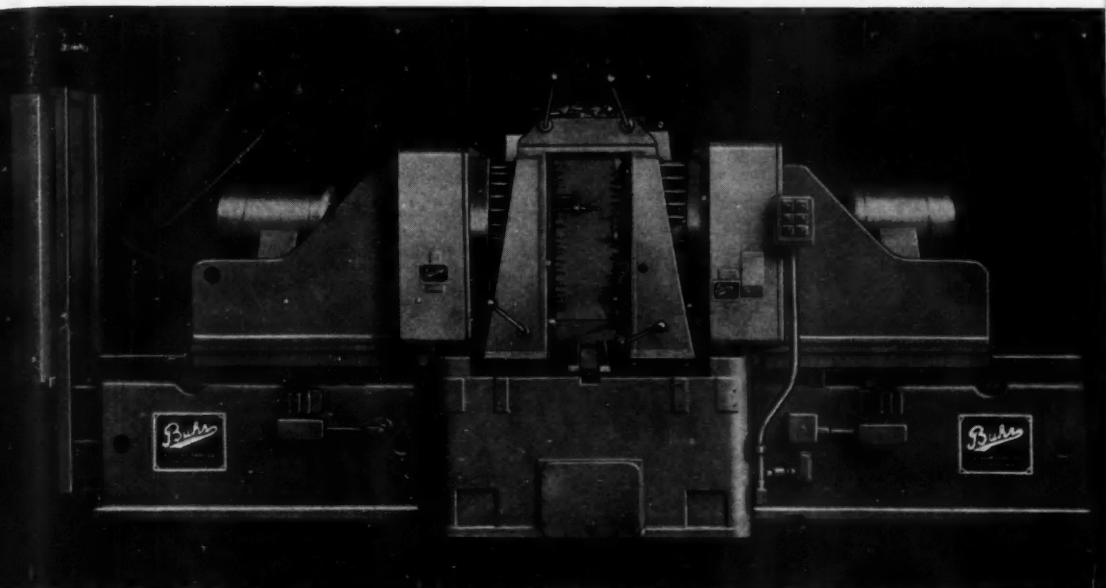
The new technique for applying finishes is said to improve surface smoothness, require less polishing, and fewer coats of lacquer to build up the specified paint film thickness on GM cars. On the other hand, it requires a revised training program for spray operators and adequate drying facilities for the applied lacquer film, but divisions adopting the system have reportedly had no difficulty in carrying out the program.

Seiberling Profits Drop as 1951 Sales Exceed 1950

According to its recent annual report, higher prices, plus greater output of large-sized truck tires, boosted 1951 sales of Seiberling Rubber Co. 14 per cent above the 1950 level. Profits, however, dipped 33 per cent below the record-high 1950 mark, due to high costs, Government limits on output, and higher tax rates.

Net sales were \$43,681,425, compared with \$38,321,118 in the previous year. Profit was \$1,216,574, compared with \$1,815,560 in 1950, from which a \$500,000 reserve for inventory price decline had been deducted. No reserve was deducted in 1951.

HERE IS WHAT STALIN HATES!



It's not tanks, planes, guns, ships, atomic bombs and armed forces that Joe Stalin hates . . . It's the productive power behind them—productive power that is symbolized by this Buhr Two-Way Hydraulic-Feed Drilling Machine

which is now hard at work day-in and day-out . . . helping one of the world's largest manufacturers turn out automatic transmission cases for tanks . . . This kind of Machine, —more than anything else—is what Stalin hates.

Industries Turn to Machinery Like This . . . which Performs 93 Operations at Once

To help stymie Stalin, one of the world's largest engine makers was awarded an enormous defense order. Production had to get under way as quickly as possible!

One of Their Problems

To drill, ream and chamfer this automatic transmission case—that was one of the problems.



To handle this very important phase of their production, they turned to Buhr.

What the Machine Does

In general—it drills, counterdrills and countersinks 41 holes in front end of transmission case . . . and drills, coun-

terdrills and countersinks 52 holes in rear end of case.

Specifically, the Machine accomplishes this—

From the left:

Drills (1) 25/32" diameter hole through
Drills and counterdrills (28) #1 holes
Drills and counterdrills (8) #2 holes
Drills (1) 29/32" diameter hole through
Drills (1) 1/8" diameter hole 3/4" deep
Drills and countersinks (2) end cover
dowels on vertical center.

From the right:

Drills and counterdrills (11) #1 holes
Drills and counterdrills (8) #2 holes
Drills (12) #3 holes through
Drills and counterdrills (12) #10 holes
Drills and counterdrills (1) #19 hole
Drills and counterdrills (8) #6 holes
Production: 40 pieces per hour at 100% efficiency.

Why They Turned to Buhr

Buhr is an old and trusted friend by many of the leading U.S. Industries. Many have turned to Buhr for the past

quarter-century. Their manufacturing facilities are excellent. In sales, engineering and production, Buhr has trustworthy and experienced staffs—staffs that are specialized in this field and able to service every part of the Country.

To Find Out About Buhr



This 48-Page Catalog . . . as well as one of our Sales Engineers . . . are at your beck and call. For every problem involving this type of Special Machinery—including defense production to halt Stalin—phone, wire, or write us.

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SPECIAL MACHINERY . . . Leaders Make Sure with BUHR

Design Trends in Commercial Vehicles and Engines

By Joseph Geschelin

Gazing into our crystal ball, we can discern a kaleidoscope of things that may one day brighten the design of heavy duty vehicles. Our crystal ball shows improvements in gasoline and Diesel engines; the emergence of gas turbines; wider use of LPG; wider use of automatic drives and torque con-

verters; and a growing use of power steering.

Noteworthy too is the big horsepower race that has been going on for some years, particularly among haulers on the West Coast. The 1952 season has seen the same surge in the passenger car field and it may well have

an important effect upon gasoline engine design in the future. Truck engines pushing above 500 hp are not a rarity—300-hp engines in the Diesel field are becoming almost commonplace. No one yet knows where this trend will lead. Some wonder whether it will persist. And only time will tell.

Although commercial vehicle developments are necessarily more conservative than in the passenger car field, the current horsepower race among passenger car builders coupled with the emergence of high performance, high economy overhead valve V-8's is bound to have its impact upon commercial engines.

During the past few months we have noted a flurry of noteworthy events including the Cummins 200 hp pancake Diesel engine for buses; other new high performance Diesel models from Cummins; and the recent announcement of the three-cylinder GMC Diesel models. There are also some foreign Diesel engine developments well worth watching.

LPG conversions, not new to fleetmen, have reached the factory equipment stage what with the recent announcement by Reo and IHC. In at least these instances the fleet operator now can buy factory equipment designed to make the most effective use of LPG, confident that every accessory installed on the engine and vehicle meets the known requirements.

We can sit back and watch the fresh impetus to gasoline engine design, stemming from the passenger car field; and parallel improvement in the familiar and dependable Diesel engines. While we watch the possible impact of LPG conversions on the truck scene, other developments of unmistakable importance are cooking behind the scenes. We refer to some unorthodox gasoline engine designs, still more or less in blueprint stage; and the growing up of the gas turbine. It may be an infant but we can see more prospects now than we did five years ago.

Several years ago we made a round-robin of the truck industry to inquire about the possibility of automatic drives. It looked quite out of the picture at the time. Meanwhile, IHC has been supplying door-to-door delivery jobs equipped with Fuller torque converters, coupled with a special IHC transmission. More recently, GMC announced its Model P-152-22 Parcel Delivery vehicle which comes equipped with the dual-range Hydra-Matic as standard. Just about the same time Ford announced its Courier model with the Ford-O-Matic as optional equipment. While admittedly these are all light vehicles there is no telling how far this trend may go in the next few years.

Gas turbines are really HOT right now, spurred principally by aircraft requirements for military purposes. We have some special comments in this connection later on.

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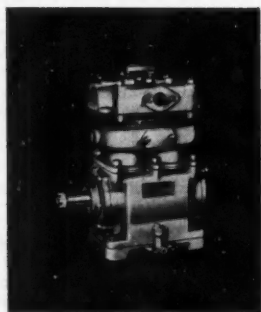
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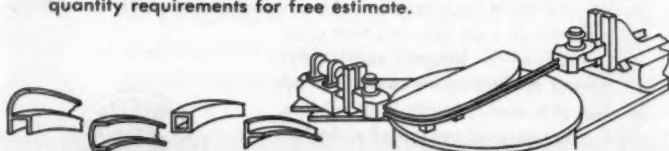


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cover all the things that have happened during the past six months or more, we shall confine this analysis to some of the major trends that may affect the picture of transportation in the near future. The fact that many important developments may go without mention in this article does not mean that we do not recognize them. It is simply a matter of selecting certain highlights arbitrarily.

Gasoline Engines

The old dependable reciprocating gasoline engine—wherever it is made and no matter by whom—still is fully capable of holding its own when it comes to mass transportation on the highways. In fact the recent revolution in passenger car engine design proves the virility and amazing flexibility of gasoline power. The trend in the passenger car field is undeniably to the punch-laden, high economy, overhead valve V-8. The L-head engine is as good as gone in this high compression phase of development. Only major exceptions to the trend are the Ford OHV Six and the Willys F-head Six.

Designed to consume higher octane fuels, these engine offer the highest bhp cu in. ratings of any engines available up to now. And fuel economy is simply out of this world by comparison with previous practice. There is no reason why this should not have its impact on heavy duty engines of the future. A tabulation of a few selected engines of this kind is given in Table I, just for comparison.

As usual, passenger car engines have boosted compression ratio above the average for heavy duty engines, most of them starting with 7 to 1 as a base and going up to as high as 7.7 to 1 in a few cases. However, even the new big engines have cut back on compression ratio in deference to the expected decrease in octane ratings of premium fuels.

Naturally the commercial engine builders must stay conservative so far as compression ratio goes. They simply can't follow the passenger car trend until we reach some bright day in the future when the synthetic fuels of fantastic octane ratings are actually available. You will recall that some prophets told us these fuels were just around the corner. It just ain't so today.

Mechanically, and from the standpoint of durability, commercial gasoline engines are at the peak of perfection. Durability features such as valve rotators, valve inserts, heavy duty copper-lead bearings, and the like have become almost commonplace. And many makes and models feature replaceable cylinder liners. The general availability and use of the heavy duty lubes also has contributed materially to increased life and greater freedom from maintenance troubles.

The new Ford engines, noteworthy examples of what can be borrowed from passenger car practice, claim

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lower friction horsepower loss because of a change to shorter stroke in both V-8's and the new OHV-6. This group of new engines, moreover, is fitted with Ford-made valve rotators for both intake and exhaust, with timing chain drive, and copper-lead main bearings for the larger models. Ford has gone all-out for full flow oil filters on its new engines. A tremendous amount of test work at Ford indicates that with full flow filters the crankcase lube is kept cleaner and for longer periods. In fact, Ford has found that if the cartridge is replaced at the regular

stated intervals, oil changes lose their importance and oil need not be dumped so frequently.

Ford too has adopted a couple of new Holley carburetors which are well worth noting for performance as well as ease of maintenance. While on the subject of carburetors, it is well to watch the four-barrel jobs produced by Stromberg and Carter which are installed on Buick Roadmaster, Cadillac, and Oldsmobile. These carburetors are responsible for an amazing increase in engine output without mechanical change.

Chrysler Corp. this season created a sensation with the introduction of the unique hemispherical combustion chamber and widespread valve layout in the OHV V-8's for Chrysler and De Soto cars. We know pretty definitely that Dodge would have emerged with a similar engine had it not been for restrictions on delivery of machinery. Right now there is a 180-hp engine in Chryslers and 160-hp in De Soto. Just think of the possibilities of such engines adapted for use in Dodge trucks. To provide something to think about, we have added these engines to Table I.

LPG and Other Developments

While still on the subject of gasoline engines, consider the LPG trend. Both IHC and Reo are on the band wagon. And the fuel situation looks good at the present time. LPG may not take the industry by storm, although this equipment is bound to make inroads as a competitor for both gasoline and Diesel. A major problem is one of fuel distribution. Large operators take care of their own fuel problem, but the smaller users will have to watch the situation and wait until there is distribution nearby.

LPG has been in use for a great many years but it is only now that factory installations have become available. There have been troublesome problems, to be sure, for the pioneers. But then the pioneers have always blazed the trail for the rest of us.

Meanwhile, work is being done to improve the gasoline engine in other quarters. At the recent SAE Transportation Meeting in Chicago there was a report on the Humphreys variable-compression ratio engine which claims extremely high fuel economy. True, it is purely an experiment, but it may have some significance eventually. One of our friends who has been working independently on engines for a great many years claims to have a variable compression ratio engine of his own in a passenger car.

Another experimental process that has been given attention in SAE circles is the Texaco Combustion Process. Whether or not it will be adopted is problematic but the lessons learned from Texas research may have their effect upon engine design.

Diesel Engines

The Diesel engine has earned a definite and important place in the transportation picture through ruggedness, dependability, excellent maintenance history, and fuel economy. In recent years Diesel engines have grown bigger in output to match the requirements of over-the-road haulers. One of the striking announcements made recently is found in the adoption of the GM 3-71, three-cylinder two-stroke Diesel in the GMC Series D450-37 light weight truck and tractor models.

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ance engines to meet the requirements of its users.

An almost fantastic report on a Diesel job in Germany, claimed to give almost 300 ton-miles per gallon appears in *AUTOMOTIVE INDUSTRIES*, February 15, 1952. This is a two-stroke cycle, loop-scavenged engine described by Prof. P. H. Schweitzer of Pennsylvania State College.

Among others, Diamond T recently announced its most powerful Diesel trucks for commercial use. The Diesel engines for Models 950 and 951 range up to 300 hp, including standard and supercharged engines built for Cummins and Buda.

TABLE 1
Bhp/cu in. Comparison
Selected 1952 Engines

Make	Type	Displacement (cu in.)	Bhp (max.)	Compression Ratio	Bhp/cu in.
*De Soto	OHV-V-8	276	160	7.1 to 1	0.579
Willis	F-head 6	181	80	7.5 to 1	0.558
*Chrysler	OHV-V-8	331	190	7.8 to 1	0.544
Ford	OHV-V-8	279	148	7 to 1	0.520
Ford	OHV-V-8	317	155	7 to 1	0.492
Ford	OHV-6	215.3	101	7 to 1	0.468
Chevrolet	OHV-6	235.5	105	6.7 to 1	0.448
Ford	L-head V-8	238	106	6.8 to 1	0.443
Ford	L-head Six	264	112	6.8 to 1	0.441
Reo	OHV-6	282	124	6.55 to 1	0.434
Reo	OHV-6	295	107	6.7 to 1	0.420

* Denotes passenger car engines.

Table I is an arbitrary sampling of some 1952 engines, particularly the new V-8's and Ford OHV-6 which represent latest practice in light-weight, high performance features conducive to exceptional bhp cu in. ratings. Included in this group are the Reo engines and the Chrysler and De Soto V-8's. The latter are included only because of the possibility that they may one day be adapted for commercial vehicle use.

It is noteworthy that the dependable Chevrolet OHV-6 shows up very well indeed in this tabulation.

Gas Turbines

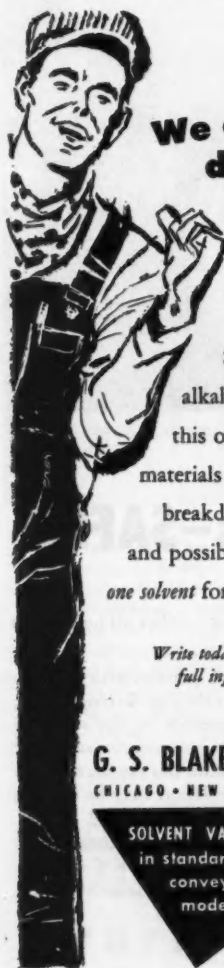
Although the gas turbine is not yet commercially available for trucks, it has come a long way since the end of the war. About the first job to be exploited experimentally was the Boeing 150-hp gas turbine which was demonstrated in a Kenworth truck a year ago. It is undergoing further development and refinements.

The writer is particularly impressed with the family of gas turbines and jet engines recently announced by Continental Aviation & Engineering Corp. Designed for aircraft applications at the start, these machines will have the benefit of production for military use. One of the most likely machines for commercial use—in motor vehicles—is the Artouste 1, a shaft turbine of 280 hp, weighing only 185 lb.

Then along comes a contribution from Paris (see *AUTOMOTIVE INDUSTRIES*, February 15, 1952) revealing the designs for a French gas turbine truck of 10 to 15 ton capacity, GVW of 36,000 lb. The layout consists of two free-piston type engines each of 120 hp, feeding a two-stage turbine.

Still another interesting job is a small gas turbine that can be started by hand. Developed by Solar Aircraft Co. for the U. S. Navy, this machine is described in *AUTOMOTIVE INDUSTRIES*, September 15, 1951.

All of this evidence proves that a lot of people are doing something about the gas turbine. As usual, part of the waste of war will include the development of machines which later may well



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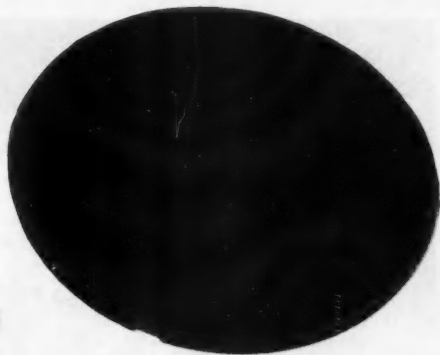
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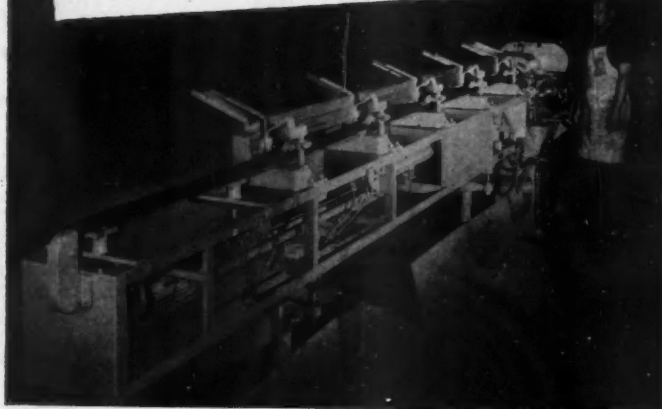
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be adapted for more useful purposes. At the present time the chief drawback of the gas turbine still remains what it was at the start, namely extremely high fuel consumption. Whether this problem can be licked satisfactorily from a commercial standpoint is something we shall have to leave to the experts.

Automatic Drives

We mentioned earlier the swing to automatic drives in commercial vehicles. True the current crop applies only to the smallest units. Whether they can be suitable for larger vehicles again is a matter for the experts and the future.

Meanwhile, both GMC and Ford now have models fitted with fully automatic drives. ICH uses the Fuller torque converter. In a recent report Twin Disc Clutch Co. describes the testing of a heavy duty truck of 130,000 lb GVW rating fitted with a new Twin Disc torque converter. It is of three-stage, single-phase type, with a direct drive clutch. One of its unique features is the utilization of a means of applying downhill braking with the torque converter, thus providing for adequate safety of operation on steep grades.

Power Steering

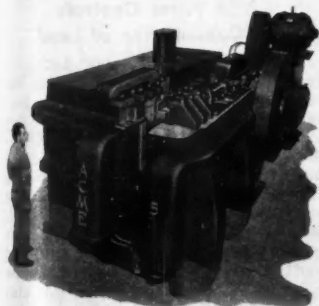
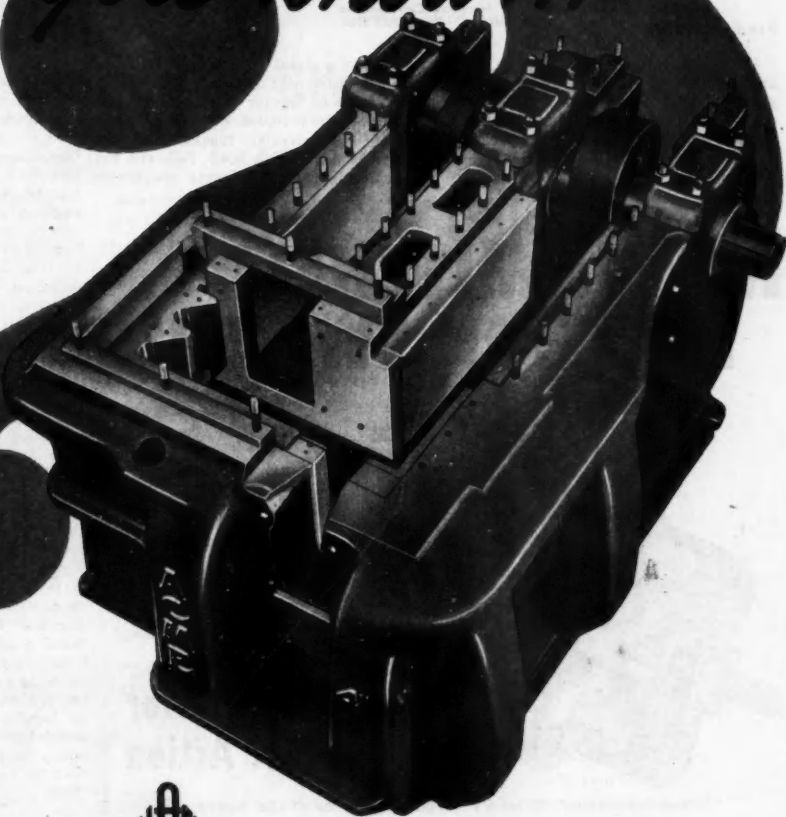
Although power steering has been used in buses, trucks and off-highway vehicles for many years, we believe that the current introduction of hydraulic steering gears in passenger cars will accelerate their adoption for the general run of highway vehicles. Power steering now is offered by Vickers, Ross, Gemmer, and Saginaw Steering Div., GMC. The latter company alone expects to produce some 60,000 units in 1952 for Cadillac, Buick, and Oldsmobile.

With both Saginaw and Gemmer in mass production, it is quite likely that cost economy will be greatly improved as time goes on, thus aiding the overall picture materially.

With weight restrictions getting worse rather than better, most motor truck manufacturers are shifting more weight to the front axle. This has the effect of increasing the load on the steering mechanism and with it an increase in steering effort even for lighter vehicles. While it is possible to offer some relief by increasing steering ratio, there has got to be a limit to the number of turns of the steering wheel for safe maneuvering.

Power steering offers the best and most practical solution, and we visualize an extension of power steering in the near future. Apart from safety, this will ease the task of driving the larger vehicles, make parking a pleasure rather than a job, and relieve drivers of fatigue.

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87 Makes of Tractors at French Exhibition

By W. F. Bradley

Special European Correspondent
for AUTOMOTIVE INDUSTRIES

PARIS, FRANCE

Occupying an area of 600,000 sq ft and featuring 800 exhibitors, this year's French agricultural machinery exhibition, held in Paris, revealed the growth of the farm tractor industry. The number of agricultural tractors in service is 163,000, with every indica-

tion that a total of 200,000 will be reached by the end of the year. During 1951 French tractor production was 16,176, of which 15,096 were wheel type and 1080 had creeper tracks. Renault headed this list with 5065, followed by French-built Massey-Harris machines

and Société Française Vierzon. McCormick tractors built in France numbered 854. Tractor imports during the year numbered 10,128 wheel type, this being a slight drop over the previous year, and 581 creeper tracks, which were down by about 40 per cent. Ferguson headed the list of importers, followed by International Harvester. Of the 87 makes of tractors on exhibition, France had 38, with Germany second with 22.

In general, agricultural tractor production in France has passed out of the hands of automobile manufacturers into those of the specialist, with the important exception of Renault, which has four main types, two of them being Diesels with Hercules or Perkins engines, one a gasoline type, and one using kerosene or methyleted spirits. French Ford showed the Fordson-Major for the first time in France. This is going into production at the Poissy factory.

Small farms favor the development of smaller type tractors than are general in the United States, and tendency is away from the creeper track and towards four-wheel drive for comparatively small machines. There are developments in air cooling of both the gasoline and heavy oil type, with examples of the flat twin and flat four. Several of the single and twin cylinder engines have taper roller bearings for the crankshaft, and in some cases light alloy rods and pistons.

An incentive to increased tractor use is to be found in the recent government decision of a tax refund on gasoline and Diesel fuel used for agricultural work. This takes the form of vouchers enabling farmers to purchase gasoline and oil at less than the normal price, these vouchers being distributed by local authorities. The uncertainty which has marked the gasoline taxation policy in France has undoubtedly limited the use of tractors on the land.

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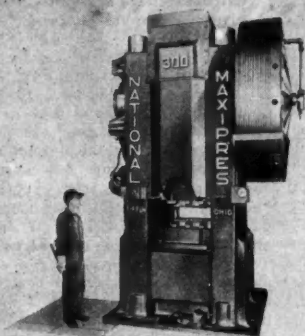
NPA Eases Controls on Consumption of Lead

The National Production Authority recently suspended its controls on the consumption of lead and upped permitted inventory levels to a 60-day supply. In an amendment to Order M-38, NPA lifted its restrictions on the use of lead and lead-base alloys in the face of a marked improvement in the supply of the heavy metal. NPA will, however, continue its allocation of soft primary domestic and foreign pig lead under Order M-76. There appears to be a good possibility, though, that this also may be relaxed if the lead supply holds up well.

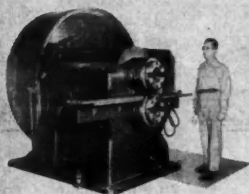
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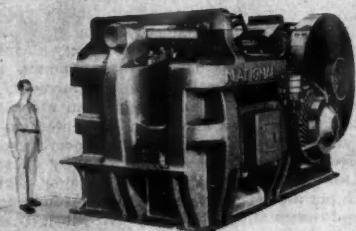
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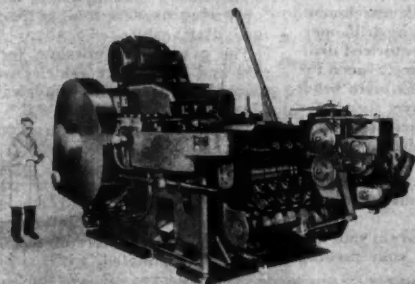
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GIVE A FORGEMAN A CLUTCH HE CAN COUNT ON!

Imagine a simple, single-plate clutch for high-performance forging machinery, one that has already demonstrated its ability to stand up to the abuse of millions upon millions of deflections and remain trouble-free.

National-pioneered Diaphragm Clutches* came on the scene in 1944, filling a forge-shop need born of World War II. Hundreds are now in service, rewriting all the old records for length of operation without clutch problems.

You can't have a "boy" of a clutch on high speed forging machinery. Diaphragm Clutches are "men" with hearts of steel that beat unfailingly, far beyond the forgerman's fondest hopes.

Diaphragm Clutches are just one more important reason underlying the dependability of National equipment, backed, of course, by years of pioneering and up-to-the-minute engineering for the forging industry.

We invite you to apply National's experience in hot or cold forging. Send us your prints or samples. Better yet, visit us. No obligation.

NATIONAL

MACHINERY COMPANY

TOFFIN, OHIO—SINCE 1874

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS • BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS

Hartford

Detroit

Chicago

SAE Meeting

(Continued from page 43)

1. Radiators of equal quality are impossible with substitute materials.
2. Although savings in copper and brass can be made with substitute materials, useful life will be shorter while cost will increase from 15 to 35 per cent. This does not include the cost of new tooling.
3. Using steel for tanks may save

as much as 30 per cent copper but at the expense of service life, since failures may be expected within a year.

4. Finally, substitutes are ruled out on the practical grounds that the lead time for making tooling changes alone is considerable; and that lead time for materials runs three to four months, making it almost impossible to plan safely in advance for mass production.

The role of inhibitors in this picture was plotted by R. W. Scoville, Chrysler Corp. He showed that at best the cooling system is a perfect environment for

corrosion; and recommended a promotional campaign encouraging the use of inhibitors in all radiators. He also stressed the need for replenishing the inhibitor during normal warm weather driving, recommending campaigning by dealers and service stations.

With substitute materials, the corrosion problem would be greatly intensified because of the electrolytic action of dissimilar metals. It would impose greater duties on inhibitors, demand more attention to the cooling system.

The paper by Dunn and White of Alcoa, given at another session, contains a section on the development of an aluminum alloy for automotive radiators, stemming from experience in producing automotive heat exchangers. They recommend use of a 3S alloy sheet with cladding of Alcoa C438. The problem of developing a suitable electrolytically protective coating has been solved by using Alcoa XA30 brazing sheet. The authors have not yet completed sufficient road testing to decide whether an exterior paint coating will be necessary to protect against road splash.

In his paper, "New Horizons in Engine Development," J. C. Zeder, vice-pres., Chrysler Corp., disclosed that an experimental, higher-compression version of the Chrysler "Fire-Power" V-8 engine, using high-octane fuel, produces 353 hp, nearly double the output of the present production model. This is accomplished without increase in engine displacement or the use of supercharging. Moreover, with standard compression ratio and burning service station premium fuel, another experimental version of the production engine has produced 309 hp.

One of the sessions at this meeting was devoted to a summary of new applications and developments in aluminum and magnesium alloys. The case for aluminum, presented by Dunn and White of Alcoa, covered some major developments recently described by Frank Jardine, manager, Cleveland Development Div., Aluminum Co. of America (see AUTOMOTIVE INDUSTRIES, December 15, 1951). In addition, the authors covered the gamut of other applications including use of aluminum for wiring harness and, in particular, for battery cables.

The case for magnesium for motor cars and heavy-duty vehicles was presented in detail by Hawawalt and Glaza, the Dow Chemical Co.

The SAE National Passenger Car, Body, & Materials Meeting, covered briefly above, was held in Detroit, March 4 to 6, 1952, and was extremely well attended. Most of the sessions drew from 450 to 500 interested engineers and practitioners of the art. The meeting culminated with a banquet. General George C. Kenney, USAF (ret.), speaking on the subject "What's With the World."

One of the highlights of the meeting, although not open except to committee members, was a session of the SAE committee on boron steels which drew an attendance of 160 members.

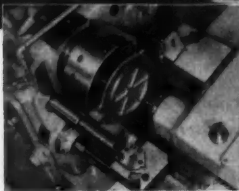
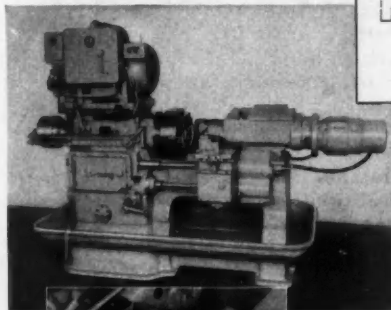
(Advertisement)

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE So-swing PEOPLE" SENECA FALLS, NEW YORK

MODEL "LR" So-swing DRILLS AND REAMS SIMULTANEOUSLY WITH TURNING AND FACING OPERATION

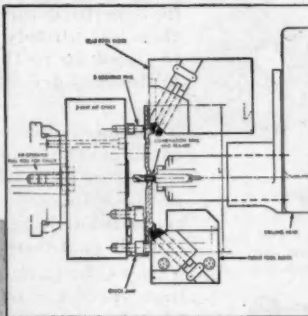
Model "LR" So-swing
Automatic Lathe
equipped with Special
Motorized Drilling Head



▲ Close-up view showing
tooling and work

Problem: To turn, face and groove the large diameter of a direct drive clutch, and to drill and ream center hole in a single operation.

Solution: The Model "LR" So-swing Automatic Lathe selected for this job was



▲ Tooling layout for machining
and drilling Direct Drive Clutch

equipped with a special Drilling and Reaming Attachment which replaced the standard tailstock. This attachment is an electrically driven, self-contained unit with its own feed cam which permits fine feed for drilling and coarse feed for reaming. Two tools on the front carriage turn two diameters. Two facing and one grooving tool are mounted on the back attachment. While all tools, including the drill, operate simultaneously, the motorized drilling head provides the correct speed for drill and reamer, while the main head-stock drive provides correct speeds for machining the large diameters.

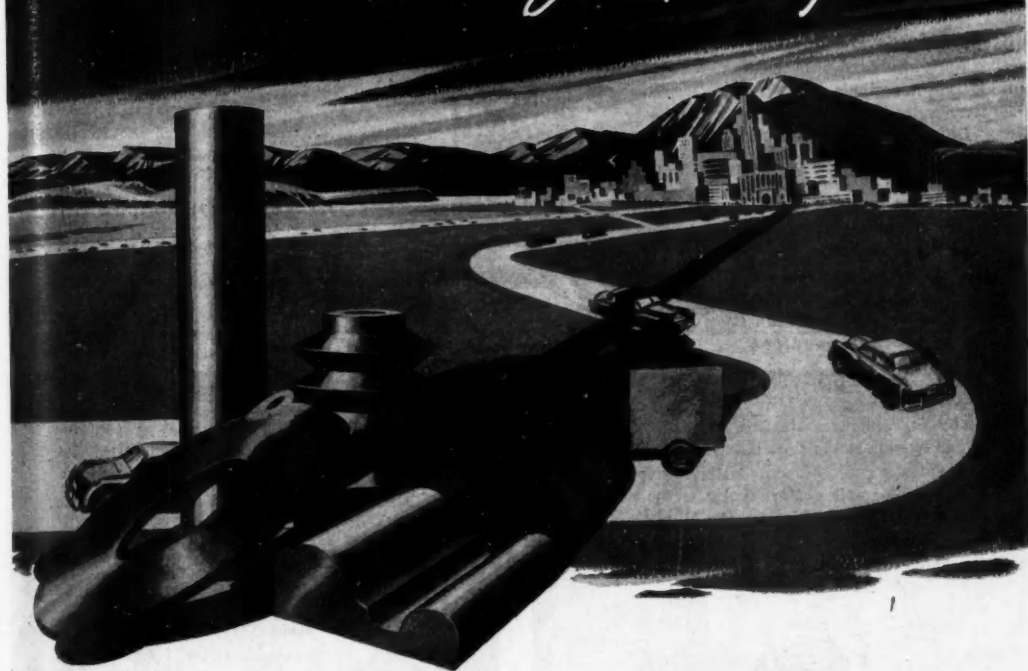
The work, which is cast iron, is held in a 3-jaw, air-operated chuck. Machining tools are cemented carbide while the combination drill and reamer is of high-speed steel.

Seneca Falls engineers are at your disposal. Let us help solve your turning problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH So-swing

The shadow of Quality...



CAST BY STALWART RUBBER PARTS!

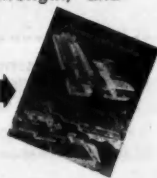
The quality of the components determines the performance of the finished product . . . and STALWART custom-engineered rubber parts are mass-produced to the highest standards. Various compounds have been developed which retain their physical, chemical and dielectric properties regardless of the effects of extreme temperatures, oil and gasoline, chemical action, abrasion or weather.

STALWART rubber compounds are supplied in precision molded, extruded, die-cut and lathe-

cut shapes for application in aircraft, automobiles, trucks, marine equipment, railroad rolling stock, processing equipment, electrical assemblies, and other equipment.

Precision-fabricated parts can have varying degrees of hardness, tensile strength, and elongation to meet individual, S.A.E. or A.S.T.M. specifications.

Write today for the new 16-page illustrated catalog Number 51SR-1 for additional details.



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400-52

STALWART RUBBER COMPANY

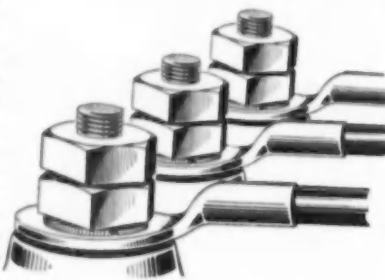
200 Northfield Road • Bedford, Ohio

Fastener Problem of the Month

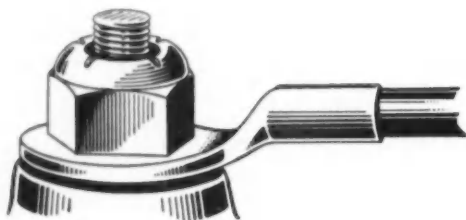
VIBRATION-PROOF ELECTRIC TERMINALS

APRIL, 1952

PROBLEM: Severe vibration action on standard nuts used on electric terminals too frequently results in loose connections. Double nuts are difficult to adjust correctly and lock washers can tear soft brass connections. Many manufacturers, making products as diverse as Diesel electric locomotives, trucks and electric toasters, require a vibration-proof terminal fastener to protect their equipment against needless power failures.



SOLUTION: Positive protection against the loosening effects of vibration is provided by self-locking brass Elastic Stop Nuts. The red elastic locking collar provides a constant and positive grip on terminal studs . . . makes continuous performance more certain by preventing ignition or power supply failures. Because Elastic Stop Nuts lock in any position on the stud, whether firmly seated or not, they are easily adjusted. They are readily removed and can be re-used.



YOU may have a similar fastening problem—or a very different one. In any case, you'll find ESNA engineers ready and able to supply a solution. Mail our coupon now, for complete information.



DEPT. N10-45, ELASTIC STOP NUT CORPORATION OF AMERICA
2330 VAUXHALL ROAD, UNION, N. J.

Please send me the following free fastening information:

☐ Elastic Stop Nut Bulletin
☐ AN-ESNA Conversion Chart

☐ Here is a drawing of our product. What fastener do you suggest?

Name _____

Title _____

Firm _____

Street _____

City _____

Zone _____

State _____

CALENDAR

OF COMING SHOWS AND MEETINGS

- 21st National Packaging Conference and Exposition, Atlantic City, N. J.Apr. 1-4
- Chicago International Trade Fair, Chicago, Ill.Mar. 22-Apr. 6
- American Society of Lubrication Engineers, Seventh Annual Meeting and Lubrication Show, Cleveland, OhioApr. 7, 8, 9
- Mobilgas Economy Run.....Apr. 14-17
- American Zinc Institute, 34th Annual Meeting, Hotel Statler, St. Louis, Mo.Apr. 21-22
- SAE Aeronautic Meeting, New York, N. Y.Apr. 21-24
- Turin Automobile Show, Turin, ItalyApr. 23-May 4
- Fifth Annual Hot Rod and Motor Sports Show, Los Angeles, Calif.Apr. 24-27
- Metal Powder Show and Eighth Annual Meeting, Chicago, Ill.Apr. 29-30
- International Foundry Congress and Show, Atlantic City, N. J.May 1-7
- API Div. of Refining, San Francisco, Calif.May 12-15
- Society of Experimental Stress Analysis, Spring Meeting, Indianapolis, Ind.May 14-16
- American Helicopter Society, Eighth Annual Forum, Hotel Washington, Washington, D. C.May 15-16
- American Society for Quality Control (sixth annual meeting), Syracuse, N. Y.May 22-24
- Memorial Day 500 Mile Race, Indianapolis, Ind.May 20
- SAE Summer Meeting, Atlantic City, N. J.June 1-6
- Third Annual Conference on Industrial Research, Columbia Univ., New York, N. Y.June 3-13
- National Truck, Trailer and Equipment Show, Los Angeles, Calif.June 12-15
- Industrial Finishing Exposition, Chicago, Ill.June 16-20
- American Society of Mechanical Engineers, Applied Mechanics Div., Shock and Vibration Instrumentation Symposium, State College, Pa.June 19-21
- American Society for Testing Materials (annual meeting), New York CityJune 23-27
- SAE West Coast Meeting, San Francisco, Calif.Aug. 11-13
- American Standards Assn., Third National Standardization Conference, Chicago, Ill.Sept. 8-10
- Instrument Society of America (sixth annual meeting), Cleveland, OhioSept. 8-12
- SAE Tractor Meeting, Milwaukee, Wis.Sept. 9-11
- Paris Automobile Show, Paris, FranceOct. 2-12
- Society of Industrial Packaging and Materials Handling Engineers, 7th Annual Exposition, Chicago, Ill.Oct. 14-16
- 37th International Motor Exhibition, London, EnglandOct. 15-22

AUTOMOTIVE INDUSTRIES, April 1, 1952

County by County . . . City by City

PINPOINT YOUR SALES APPROACH



POLK MARKET VALUATION INDEX

Every pinpoint on a map . . . every sales area . . . can be accurately measured in the automotive industry because actual sales statistics are available. No other industry can gauge market potentials . . . establish sales quotas . . . determine advertising so accurately . . . or merchandise its products as efficiently because actual car and truck registration statistics are available—and compiled for you.

Now, to this invaluable registration information Polk has added a new service . . . has devised a new labor saving method of using such information. On specially

printed forms it is now possible to obtain:

- number of cars and trucks in operation as of December 31, 1951.
- for each urban post office town; arranged by county and state.
- printed on 8½ x 11" sales-control worksheets with column headings under which you can post your own sales figures, expenditures, and potentials . . . comparing it instantly with basic registration facts about the size of each market.

Learn the complete story of this new Polk service that makes fuller use of car and truck registration statistics. Let us tell you how it can fit into your sales picture.

★ ★ ★ ★ ★ *Serving the Automotive Industry and its Dealers Since 1923* ★ ★ ★ ★ ★

R. L. POLK & CO. MOTOR STATISTICAL DIVISION
431 Howard Street • Detroit 31, Michigan

BRANCHES: New York • Chicago • Philadelphia • Cleveland • St. Louis • Cincinnati

ALSO

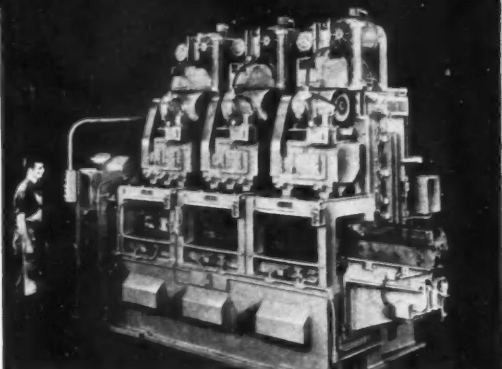
Planned Direct Mail Promotions . . . Consumer Research . . . City Directories . . . Automotive Statistics . . . Polk Bankers' Encyclopedia . . . Mailing Lists . . . Contest Management

6 Examples of SUNDSTRAND ENGINEERED PRODUCTION

Basically, there are two approaches to solving production milling problems, (1) obtaining standard machines, then trying to process parts over these machines so as to meet production requirements, (2) designing the most productive processing method, then obtaining machines to suit this method — standard or semi-standard machines, if possible, or entirely special machines, if necessary.

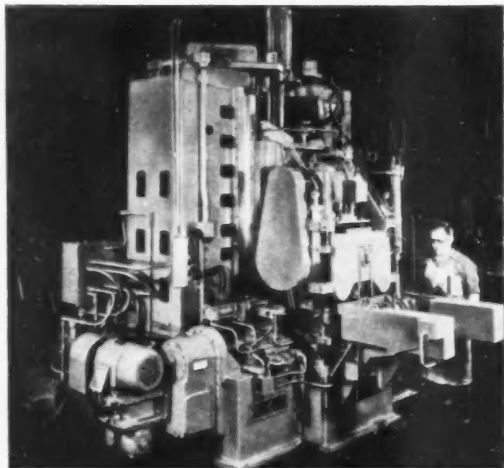
This latter method is Sundstrand "Engineered Production" . . . the most practical approach to economical metal working production.

Here are some representative examples of these machine tools and services offered by the Machine Tool Division of Sundstrand. Standard basic machine designs and units, coupled with methods engineering assistance, have resulted in many cost-saving Sundstrand installations. If you have metal working operations in your plant and are interested in lowering manufacturing costs, call in a Sundstrand representative. He'll be glad to assist you in obtaining more economical methods. There is no obligation for this service.



Milling And Notching Main Bearings Of 115 Cylinder Blocks Per Hour

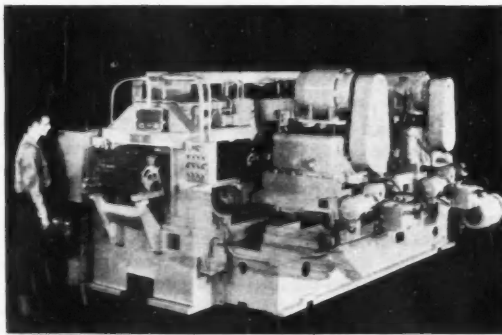
Transfer type Rigidmil with 3 rise and fall heads. Operations include milling and notching the main bearings of cylinder blocks. Both ends of bearings are milled by the first two heads simultaneously, while third head mills the notches.



Milling Locating Notches In 96 Crankshafts Per Hour



This special Rise and Fall Rigidmil mills the locating notches in crankshafts. Parts are shuttled in and out of machine on conveyor. Head mounts 8 cutters, which mill notches in both sides of part.



Milling Both Ends Of Cylinder Blocks At 86 Per Hour

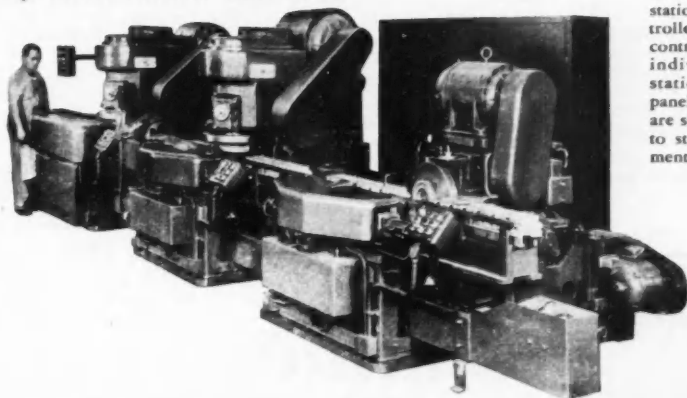
This transfer-type Rigidmil simultaneously rough and finish mills both ends of 86 cylinder blocks per hour. Four opposed heads, two each for roughing and finishing, travel back to their feed start positions as blocks are shuttled to fixtures. Feed is 60 inches per minute.

RIGIDMILS

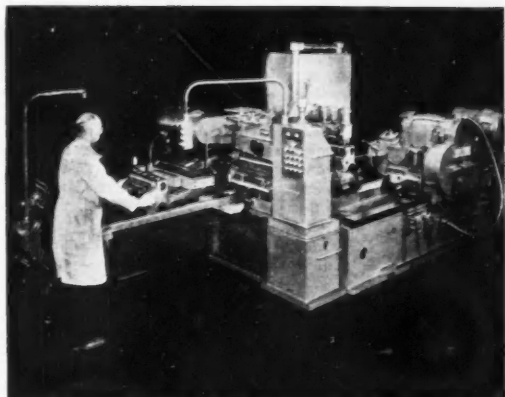
AUTOMATIC LATHES

HYDRAULIC EQUIPMENT

Milling Top, Bottom And Both Sides Of 44 Cylinder Heads Per Hour



Special transfer type Rigidmil with three milling stations, one turn-over, an idle station and loading and unloading stations. All stations controlled from the master control button panel or individually from the station button control panels. Cylinder heads are shuttled from station to station by the movement of the milling heads.



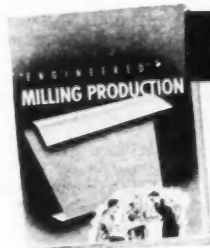
Mixed Lots Of 4 And 6 Cylinder Blocks Rough And Finish Milled

Traveling Head Process Rigidmil which rough and finish mills both ends of cylinder blocks in mixed lots of 4 and 6 cylinder sizes. Each of the two 25 HP opposed heads, operating simultaneously, complete rough and finish cuts in one automatic cycle.



Milling, Drilling And Counter- boring 113 Manifolds Per Hour

Special 5 station process machine that completes milling, drilling and counter-boring of exhaust manifolds with one handling of part. All operations are performed at the rate of 113 manifolds per hour.



FREE

Additional Data
on any or all of these machines is available. For complete set of literature ask for bulletin 218.



SUNDSTRAND Machine Tool Company

2571 Eleventh St. Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES

SPECIAL MILLING AND TURNING MACHINES

MEN in the NEWS

(Continued from page 25)

General Motors Corp., Cadillac Motor Car Div.—**R. H. Fernwood** has been appointed car distribution manager, succeeding **J. W. Dunivan**, who has been transferred to the general sales manager's staff on special assignment.

Westinghouse Electric Corp., Transformer Div.—**Chris H. Bartlett** has been named manager.

General Motors Corp.—**Roy E. McCullough** has been made resident plant manager in charge of manufacturing at the AC Spark Plug division Milwaukee plant, to succeed **Paul W. Rhame**, who becomes general manager of the Rochester Products division of GM at Rochester, N. Y.

E. I. du Pont de Nemours and Co., Inc.—**Dr. W. R. Cornthwaite** has been chosen manager of the sodium products group in the sales division of the Electrochemicals Department. He was formerly manager of the vinyl products group.

Marmon-Herrington Co., Inc.—**William P. Flynn** was elected to the Board of Directors.

Willys-Overland Motors, Inc., Landing Gear Div.—**Merle W. McLaughlin** has been appointed manager.

Morris Machine Tool Co.—**Clifford R. Meyer** has been appointed vice president and secretary.

Peerless Machine Co.—**C. O. Wanvig, Jr.**, formerly secretary, was elected president. Other company officials announced are: **Frank T. Frey**, vice president; **O. M. Jensen**, vice president in charge of engineering; **Frank T. Wruk**, vice president in charge of sales, and **J. P. Hanson**, secretary and treasurer. **Otto Geschke** has been appointed assistant secretary and purchasing agent.

Air Reduction Co.—**Dale D. Spoor**, former chief of the industries branch has been appointed manager of the Equipment and Process Sales Department.

Detroit Stamping Co., Stamping Div.—**George A. Bentley** has been named sales manager.

Goodyear Tire & Rubber Co.—**H. J. Osterhof** has been appointed director of research, while **A. J. Gracia** has been made assistant manager of research and development activities. **W. W. Vogt** has been chosen development manager of the Tire and Compounding Div.

Packard Motor Car Co.—**Michael J. Kollins** has been named service engineer.

Detrex Corp.—**John Nuber** has been appointed assistant chief engineer, and **Stewart Millar** has been chosen supervisor of engineering standards and development.

International Harvester Co.—**T. R. Moulder** has been appointed manager of the company's Indianapolis, Ind., motor truck district sales operations, succeeding **Lloyd W. Hully**, retired.

The Standard Products Co., Reid Division—**Robert G. Dailey** has been promoted to sales manager.

Mid-West Abrasive Co.—**R. J. Foresman** has been elected to the board of directors. **J. A. Kretschmar** has been appointed assistant secretary, and **V. O. Smith** has been chosen assistant treasurer.

Trailmobile, Inc.—**William A. Burns, Jr.**, has been named president. **S. E. Biggs** has been appointed vice president in charge of manufacturing, while **James E. Nickerson** has been made vice president in charge of credits.

Detrex Corp.—**P. W. Moehle** has been appointed sales manager of national accounts.



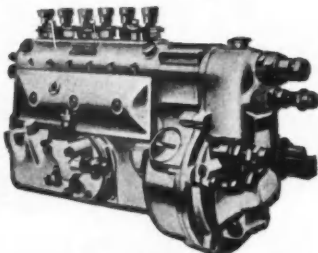
Confidence Abroad



Transport operators all over the world have learnt to trust this sign.

In any language the letters on the C.A.V. sign stand for first-rate service facilities, maintained by highly-trained craftsmen, using special precision equipment.

Wherever vehicles fitted with C.A.V. Fuel Injection Equipment are exported—whether to Trondheim, Santiago, Hong-Kong or Sydney—there's a service agent or depot to give it the specialist attention needed for such high-precision equipment.



Fuel Injection and Electrical Equipment

Service Depots throughout the World

C.A.V. DIVISION OF LUCAS ELECTRICAL SERVICES INC.

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SALES OFFICE: 14920 DETROIT AVE., CLEVELAND 7, OHIO

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Industry News

(Continued from page 24)

Chrysler Official Blasts U. S. Controls, Cutbacks

During a recent speech, A. vander-Zee, Chrysler Corp.'s vice president in charge of sales, stated that current defense contracts would absorb only a relatively small proportion of the automobile industry's manpower. Sharply criticizing Government regulation of materials and cutbacks in automobile production, especially since quantity delivery of military items is months away, he expressed the belief that both civilian and military needs could be met without regulation.

OPS Approves Hikes in Nash Rambler Ceilings

The Office of Price Stabilization recently announced approval of increases in retail price ceilings for Nash Rambler cars ranging from \$97 to \$103. Although OPS already had approved percentage increases of approximately four per cent for the Statesman and Ambassador lines, Nash did not request these at the same time. It is believed that the raises will be requested later for the 1952 models in these two series.

Bethlehem Steel Sales Up Profits Fall Off

In its recent annual report Bethlehem Steel Corp. showed sales of \$1,799,506,346, the highest for any peacetime year, compared with \$1,445,404,331 for 1950. Net income, however, declined to \$106,531,293 from \$122,076,071 in the preceding year. The decline in earnings was the result of \$153,657,940 for federal income and excess profits taxes and \$122 million for state, local, and miscellaneous taxes.

The company during the year increased its rated steel producing capacity to 16.8 million net tons from 16 million at the end of 1950. Another 1 million net tons will be added in the first half of the current year, and further increases in potential output will bring the company's annual rated capacity to 18.4 million net tons by the end of 1953. Bethlehem plans to spend a total of \$289 million for new plants and other facilities on which it had obtained certificates of necessity up to Dec. 31, 1951.

Thompson Products Sales Hit New Mark During Fiscal 1951

Consolidated net sales of Thompson Products, Inc., for the year ended Dec. 31, 1951, were \$194,899,449, the highest in the company's history. Net profit, however, dropped to \$7,687,246 from

\$8,252,459 in 1950, when sales totaled only \$123,312,550, largely as the result of higher income taxes.

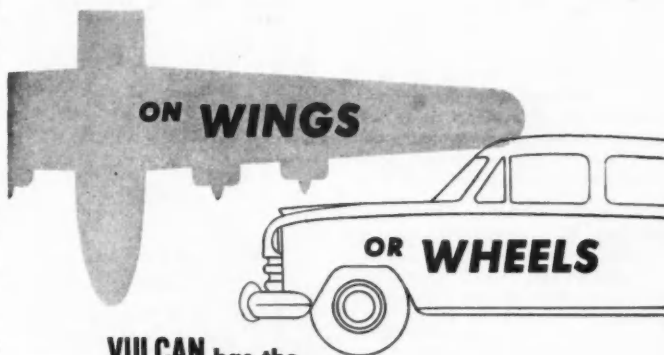
The sharp increase in sales was attributed primarily to higher sales of aircraft products, approximately 100 per cent over the volume in this field for 1950. Appreciable gains were also reported in sales to manufacturers of automobile, marine, and industrial products.

Thompson also reported a number of noteworthy additions to plant facilities, including both purchased and leased properties, during 1951. Facilities brought into operation or scheduled for

operation during 1952 will add approximately 1.4 million sq ft to bring the firm's total floor area to nearly 4.35 million sq ft.

Packard Experimental Car Designed for Outdoor Men

Packard Motor Car Co. has announced an experimental futuristic car that is said to be designed especially for the sportsman. The car has an unusually large (50 cu ft) trunk compartment for hunting, fishing, and camping equipment. Called the Saga-Macauley, it also features a 155-hp,



VULCAN has the special coated fabric **DIAPHRAGMS**

FOR AUTOMOTIVE AND AIRCRAFT CONTROLS

Wherever component design requires actuating diaphragms or synthetic rubber coated fabrics having special properties, VULCAN has the knowledge and facilities to solve the problem.

Leading equipment manufacturers choose VULCAN diaphragms and fabrics for such applications as

- Fuel Pumps
- Instrument Diaphragms
- Vacuum Booster Pumps
- Carburetors
- Dashpot Mechanisms
- Fuel Metering Controls
- Hydraulic and Pneumatic Control Mechanisms

Fabrics available in a wide range of specifications as to base fabric, gauge and properties of coatings. Highly resistant to gasoline, oils, aromatics, alcohols, butane, propane and solvents. High heat and cold resistance.

Bring us your problems. Our engineers will work with yours. Write for literature.

VULCAN **RUBBER**
PRODUCTS, INCORPORATED

58th Street and First Avenue • Brooklyn 20, N. Y.

Here's
How

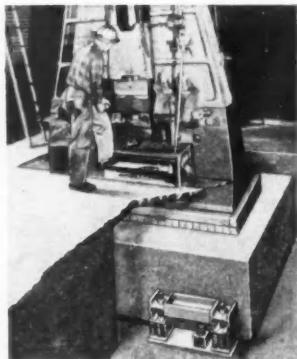
Thompson Products, Inc.
INCREASED PRODUCTION
WITH STRAIGHT-LINE
WORK FLOW.

...by Controlling Hammer Shock

Thompson Products, Inc., manufacturers of automotive, aircraft, and electronic precision parts, found that hammer vibration made accurate work on nearby grinders impossible. In fact, a new building was planned to segregate the hammers from the grinders, sacrificing the benefits of straight-line production.

However, Korfund spring-isolated hammer foundations completely solved the problem—permitted use of the hammers and grinders side by side for maximum production. And no new building was needed.

Materials handling costs were cut, construction costs reduced, hammer and worker efficiency increased, and maintenance costs on hammers, grinders, and buildings were reduced.

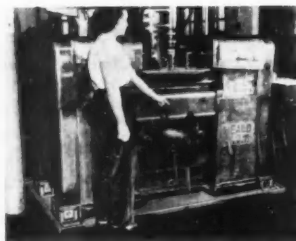


Typical spring-isolated foundation for a 25000 steam hammer. Tests prove there is actually a slight increase in hammer blow efficiency. Shock isolation is so complete that a coin will remain standing on edge beside the foundation as maximum blows are struck!

...by Shock Mounting Machine Tools

For maximum work-flow on piston machining lines, Thompson installed two automatic boring machines 10 feet apart. With both machines operating, shock transmitted from one to the other caused intermittent skips and gouges.

One machine had to be kept idle until they were both mounted on Korfund steel spring Vibro-Isolators. Now they operate together and turn out perfect work. Yet the cost of Korfund complete isolation was little more than with less effective methods.



Today's automatic machine tools, built to perform several operations in sequence, pay off in high production to close tolerances when protected from external disturbances.

You will find Korfund data sheets in Sweet's Mechanical Industries, Process Industries, Engineering, or Architectural Files. We'll also gladly supply complete information and recommendations, without obligation. Just contact us, or the Korfund representative you'll find in most principal cities. A half century of experience is at your disposal.



48-02 A Thirty Second Place • Long Island City 1, N. Y.

straight-eight engine, extra steel striping to support the frame, Ultramatic transmission, power steering, power brakes, and safety-type rims.

Packard at present has no definite plans to put the car into production. The company estimates that it would retail somewhere in the neighborhood of \$5,000.

Univ. of Michigan to Expand Its Engineering Facilities

The University of Michigan has announced that space for expanding engineering laboratories for research and instruction will be provided on its 267-acre north campus. Three buildings of interest to engineers are planned for the near future: the Cooley Memorial to house part of the Engineering Research Institute; the Phoenix Memorial to provide added space for radiation studies; and an automobile and propulsion unit.

OPS Approves Ceilings for De Soto Eight Line

The Office of Price Stabilization recently approved basic retail dollars-and-cents ceiling prices for the new De Soto custom eight-cyl line of passenger cars. OPS stated that prices for the line range from \$172 to \$177 above those for the six series. Basic ceilings for the eight are: four-door sedan, \$2,525; club coupe, \$2,505; sportsman hardtop convertible, \$2,837; convertible coupe, \$2,934; and station wagon, \$3,113.

Link-Belt Sales in 1951 42 Per Cent Above 1950 Rate

Link-Belt Co. recently announced that its 1951 sales set a record of over \$118 million, 42 per cent above 1950 sales of approximately \$83 million. Higher income taxes, however, cut net income to \$8,166,453, compared with \$8,586,675 in 1950.

Wagner Electric Profits Off Despite New 1951 Sales High

Net sales in 1951 of Wagner Electric Corp. soared to a new high of \$90,650,107, according to its recent annual report. Net income for the year, however, dropped to \$3,456,824 from \$5,094,279 in 1950, when sales were \$80,967,620.

New Pay Increases Announced by General Motors and Ford

General Motors Corp. and Ford Motor Co. recently announced cost-of-living pay boosts for 523,000 hourly-rated and salaried employees for the coming quarter. The raises, which average approximately three cents an hour, are based on a rise in the Government's commodity index from 187.8 for Oct. 15, 1951, to 190.2 for Jan. 15 with a rent factor of 0.8 added.

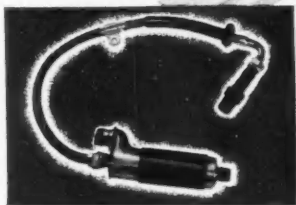
(Turn to page 112, please)



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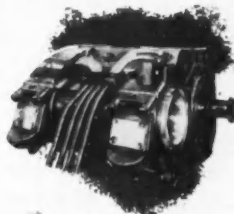
Have you considered G-E silicones in your products? Perhaps you need a resin or a varnish for bonding or impregnating purposes. Perhaps you need a resilient material for gaskets or sheeting. Or do you need a fluid to impart water-repellency to masonry surfaces? Whatever your need, it will pay you to investigate G-E silicones. You may find a ready answer to your problem.

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112

Industry News

(Continued from page 110)

Glenn L. Martin Co. Showed Sizable Loss in 1951

According to a recent report, Glenn L. Martin Co. suffered a net loss for fiscal year 1951 of \$22,178 million, after a special tax adjustment credit of \$342,000. The preliminary proxy statement included estimated losses of \$22 million on contracts for commercial type aircraft and \$2 million on certain defense production subcontracts. In 1950, the company had a net profit of \$3,127,774.

Vital Metals Imported for M-47 Tank

According to a statement made by General J. Lawton Collins, Chief of Staff, U. S. Army, before the 63rd Annual Meeting of the U. S. Armor Association, few people fully appreciate the magnitude of our program to obtain the strategic raw materials needed for our tank production. He said that each M-47 tank requires: 1915 lb of chromium, 99 per cent of which is imported; 950 lb of manganese of which 92 per cent is imported; 520 lb of nickel of which 92 per cent is imported; 100 lb of tin 78 per cent of which is imported; 6512 lb of bauxite 65 per cent of which is imported; and 1484 lb of copper of which 29 per cent is imported.

Net Earnings of International Nickel of Canada Reach High

Net earnings of International Nickel Co. of Canada, Ltd., and subsidiaries for the year ended Dec. 31, 1951, reached an all-time high of \$62,875,571, according to its recent annual report.

Net sales during the year amounted to \$286,785,241, compared with \$228,071,346 in 1950. Income taxes of the company rose to \$48,148,718 from \$27,597,615 in the previous year.

Although production increased, the years' total deliveries of nickel in all forms of 243,865,030 lb were less than the 256,410,543 lb in 1950, when the smaller production of that year was augmented by deliveries from stocks accumulated in 1949. Deliveries in 1951 of refined copper and of platinum metals exceeded those of any other post-war year, the report discloses. In the former case the increase was 11 per cent over that for 1950.

GE Sets Up Accessory Turbine Operation

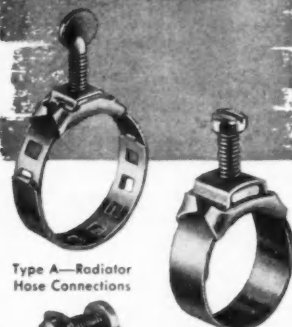
General Electric Co. recently announced the expansion of its aviation equipment business to include a new Accessory Turbine section for the design, manufacture, and sale of turbine-driven accessories for jet engines and aircraft.

(Turn to page 114, please)

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NOC-OUT HOSE CLAMPS

*The Standard
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Type A—Radiator
Hose Connections



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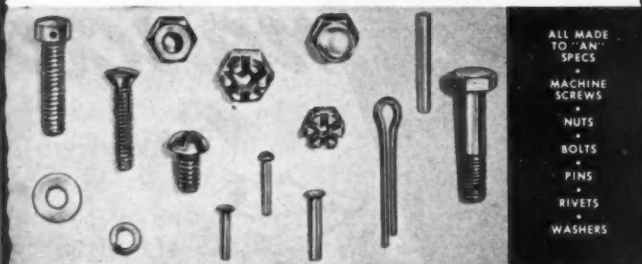
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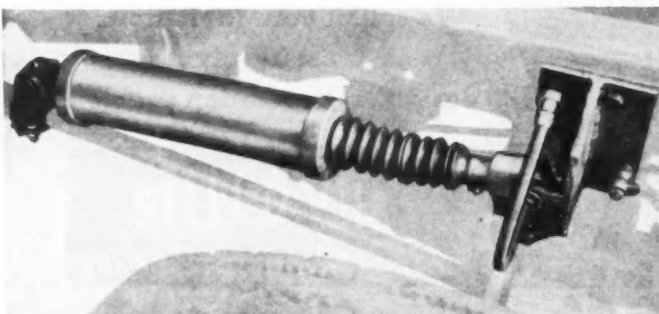


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Industry News

(Continued from page 112)

DeHavilland to Double Output of Jet Comets

DeHavilland Aircraft Co., which developed the Comet jet airliner, recently announced that another aircraft manufacturer, Short Brothers & Harland, has agreed to build the plane. The additional facilities are expected to double the British firm's production of the Comet.

Curtiss-Wright Profit Down But 1951 Volume Higher

Curtiss-Wright Corp. has reported a net income of \$6,908,216 for fiscal 1951, compared with \$7,278,564 during 1950. Sales, however, rose from \$135,662,863 in 1950 to \$176,625,380. The drop in profits is readily explained by the fact that federal income taxes soared to \$8,050 million in 1951, compared with \$6,350 million in the preceding year.

Chrysler Stockholders to Vote on Stock Options for Officers

Chrysler Corp. has announced that its stockholders will vote on a proposed stock option plan for officers and key employees at its annual meeting April 15. If the plan is approved, 400,000 shares of common stock would be reserved for use. As a start, 120,000 options for shares would be granted to 15 salaried officers and key employees, and 280,000 shares would be reserved for additional options from time to time.

Option price reportedly would be not less than 95 per cent of the "fair market value of the common on the date on which options were given." Chrysler has 20 million shares of authorized common stock, and 8,702,264 of these (not including treasury shares) were reported to be outstanding in February.

Worker Ideas Cut M-47 Tank Costs

According to a recent report, workers at the Detroit Arsenal have suggested parts and engineering changes in the M-47 tank which allegedly will save \$14,000 on each tank produced.

Packard Stock Distribution Seen as Being Widespread

In a statement issued prior to the release of its 1951 annual report, Packard Motor Car Co. reported that it is owned by 106,194 shareholders, nearly 60 per cent of whom hold less than 100 shares of stock. A breakdown in stock distribution shows that no single holding exceeds two per cent of the total stock. The average is said to be 141 shares for each investor.

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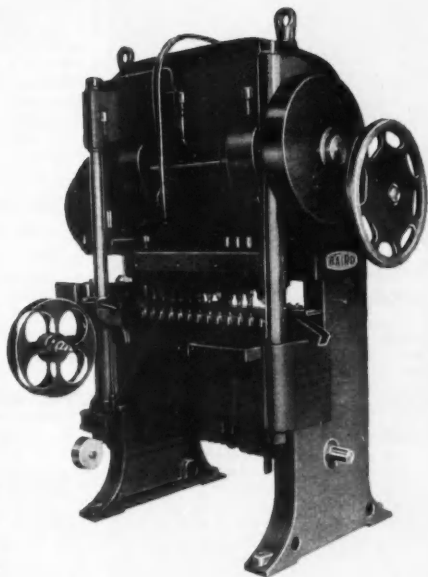
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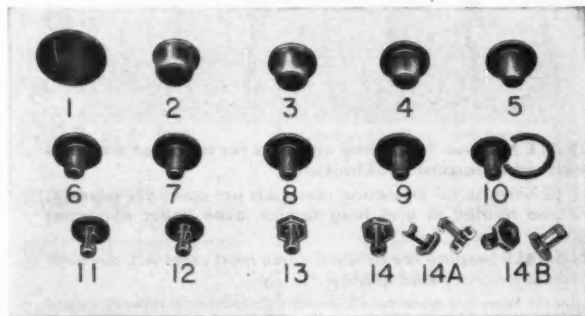
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HEX LOCK NUT COMPLETED IN ONE OPERATION



It starts with the round blank No. 1 and continues through the drawing operation to station No. 9. At station No. 10 the flange is trimmed to size for Hexing. Station No. 11 — the two sides are pierced. No. 12 is sizing. No. 13 — the Hexing is done. No. 14 — the end hole is pierced and the piece is completed. Figure "A" is a piece cut in two to show the section. "B" are completed pieces. The production is 70 pieces per minute.

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Test Models of XF-102 Plane To Be Ordered by Air Force

The Air Force is reportedly preparing to order test models of a delta-wing interceptor fighter plane with highly advanced automatic electronic controls. The plane, designated the XF-102, is being built by Consolidated Vultee Aircraft Corp., while Hughes Aircraft Co. is said to have developed an automatic pilot and firing system. Details are top secret, but they are reported to put the fighter in a position to shoot down an enemy bomber at high altitudes by radar controls with the pilot only monitoring them.

The plane also is expected to carry a guided missile that would be fired automatically when the interceptor reaches a distance from the bomber at which a "kill" would be practically certain. It is claimed that the plane will fly faster than sound and will have a phenomenal rate of climb.

Boeing Awarded Contract for Atomic Engine Plane

The Dept. of Defense announced recently that it has awarded to Boeing Airplane Co. a contract for the construction of a large bomber that will house an atomic engine. Boeing reportedly will work closely with Pratt &

Whitney Div. of Niles-Bement-Pond Co. which is building the engine for the atomic plane.

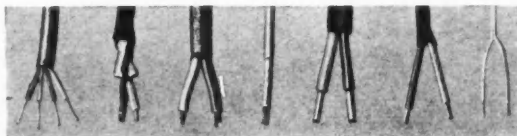
Although no details of the Boeing contract were disclosed, it is said that both the plane and the P & W engine will be a different type from the air-frame and engine under development by Consolidated Vultee Aircraft Corp. and General Electric Co.

Republic Builds Mobile Unit for Fueling Rocket Aircraft

Republic Aviation Corp. recently disclosed development of a mobile refueling system for rocket-powered interceptor planes. Said to be the first apparatus of its kind capable of fueling a rocket-propelled plane quickly, the unit is a 12½-ton servicing truck.

The truck has a large tank in the rear designed to hold 900 gal of liquid oxygen, while at the forward end is a 700-gal tank holding the water-alcohol mixture. This, combined with the truck's eight nitrogen bottles, completes the storage facilities. Additional equipment includes: an engine-generator, a fire extinguishing system, a compressor, and an electric pump. The rig, which reportedly can be operated by as few as two men, is being used by the Air Force on several types of planes.

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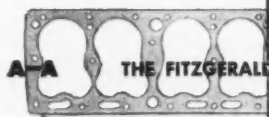
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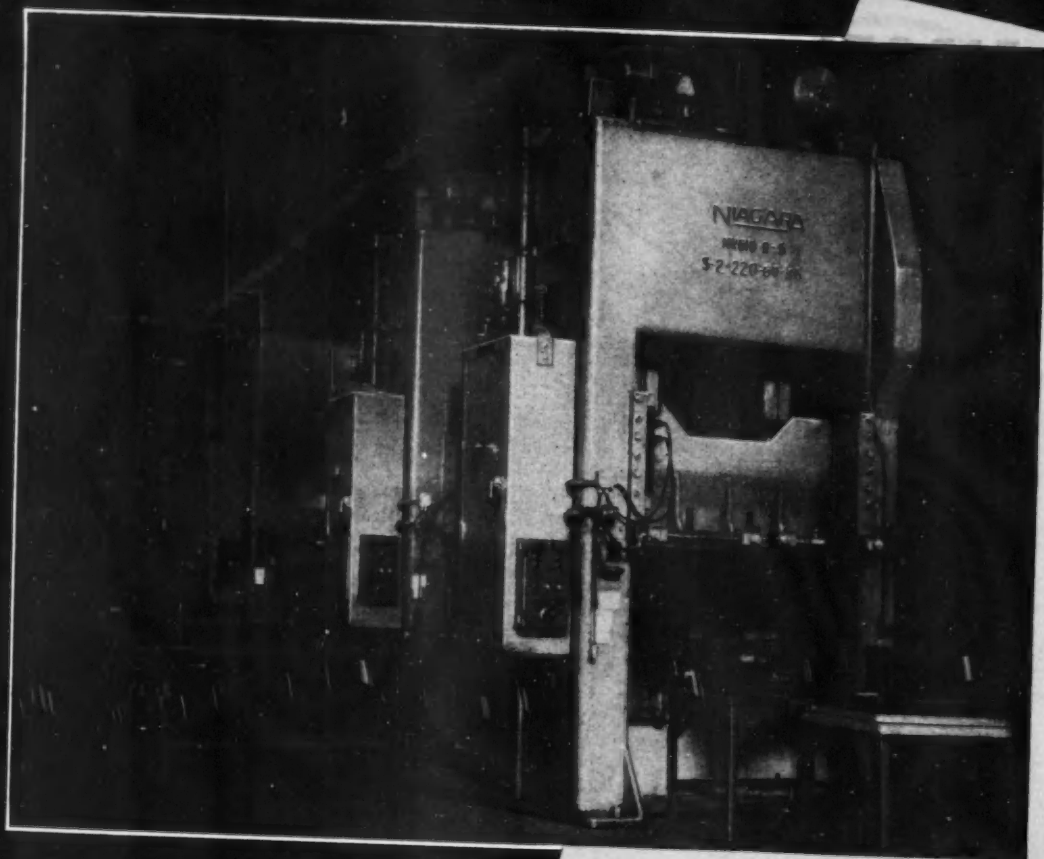
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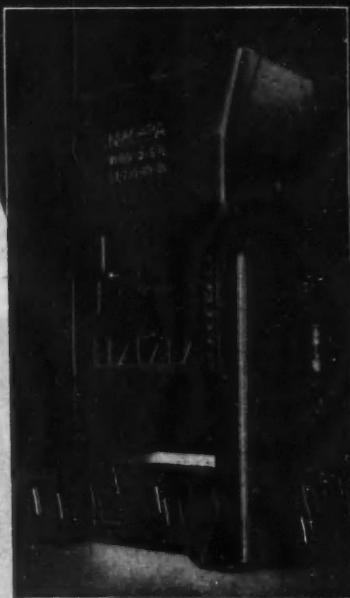
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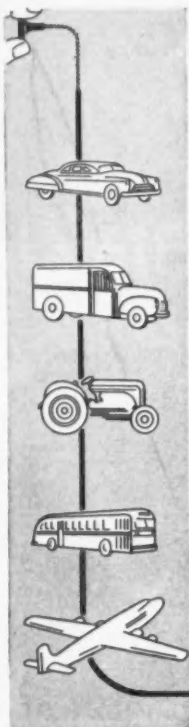
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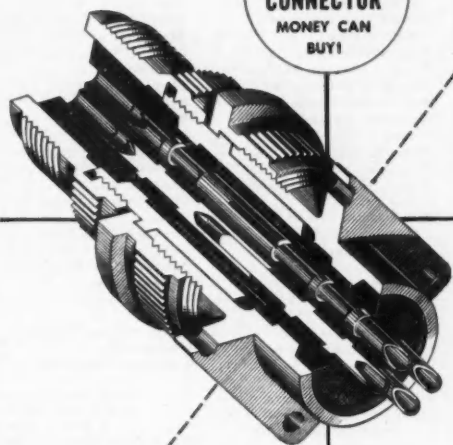
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- ❑ How long should these alloys remain in the deoxidizing solution? See *Immersion Charts* on pages 9 and 10.
- ❑ What effects do different immersion times have on resistance? See *Resistance Curves* on page 11.
- ❑ What's the best rinse temperature after cleaning? after deoxidizing? See page 12.
- ❑ Do you have efficient controls for the concentration and temperature of your cleaning and deoxidizing solutions? See page 14.
- ❑ What advantages should you insist on when selecting materials for preparing aluminum for spot welding? See page 17.

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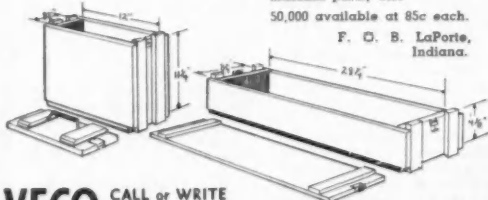
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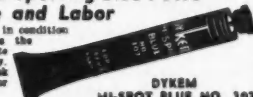
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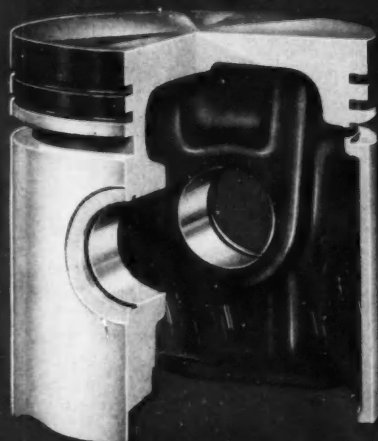


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